6-1-1993

Volume 36, issue 3

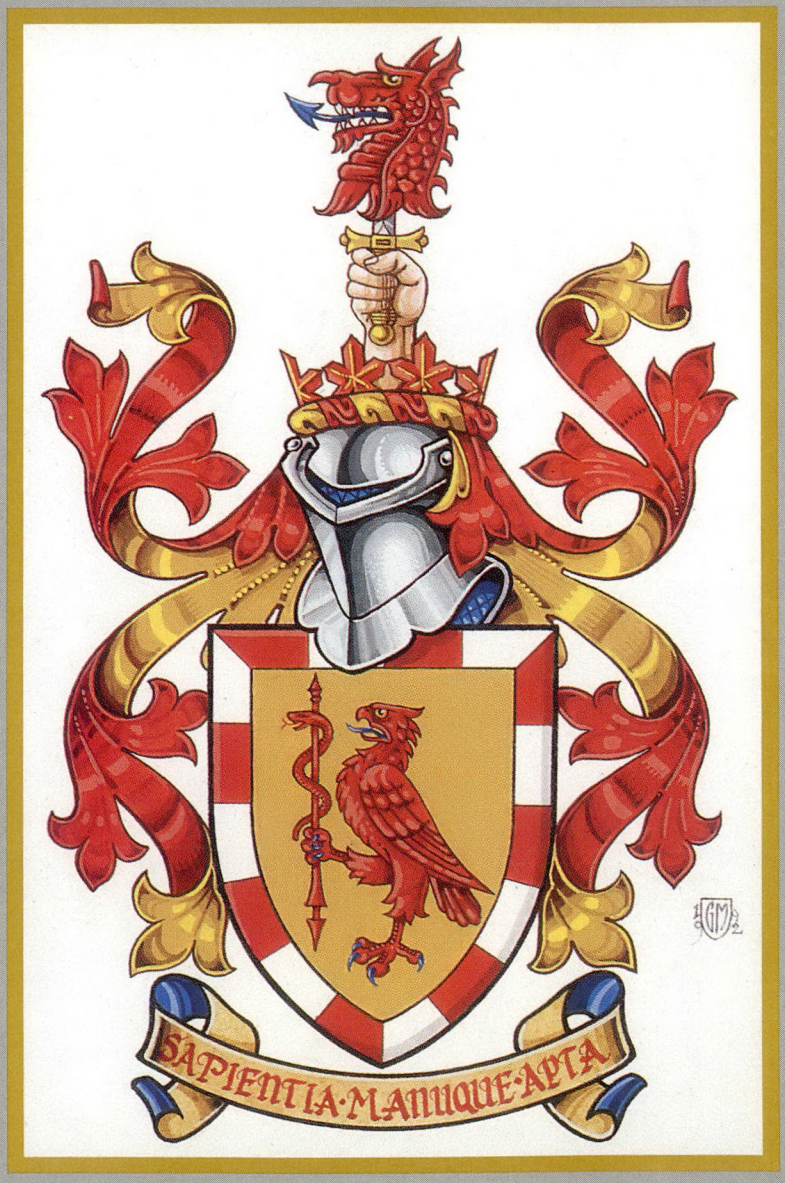
Canadian Medical Association

CJS

Canadian Journal of Surgery
Journal canadien de chirurgie

Vol. 36, No. 3, June 1993 juin

- Operation for Recurrent Glioblastoma
- Hip Arthroplasty and Rheumatoid Arthritis
- Survey of Laparoscopic Cholecystectomy



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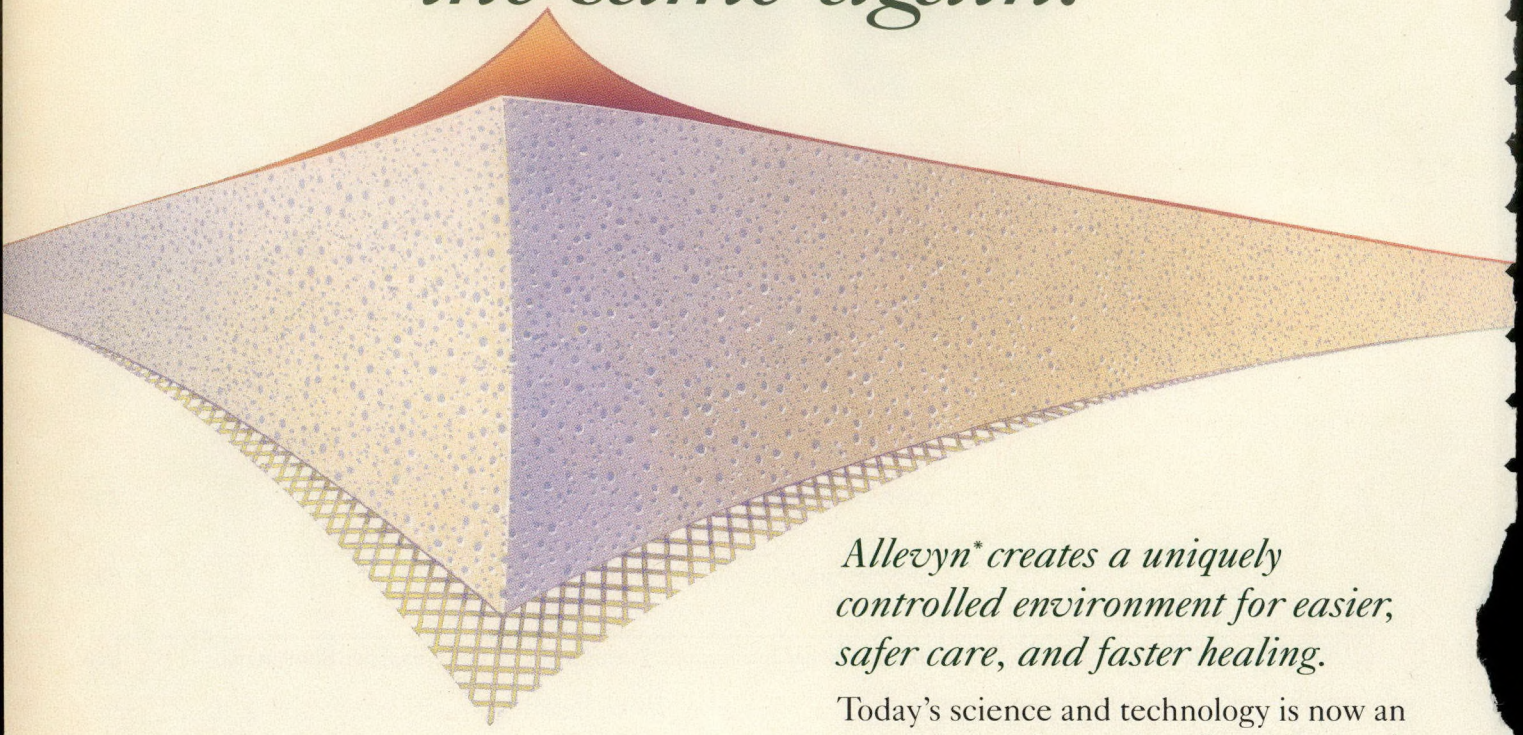

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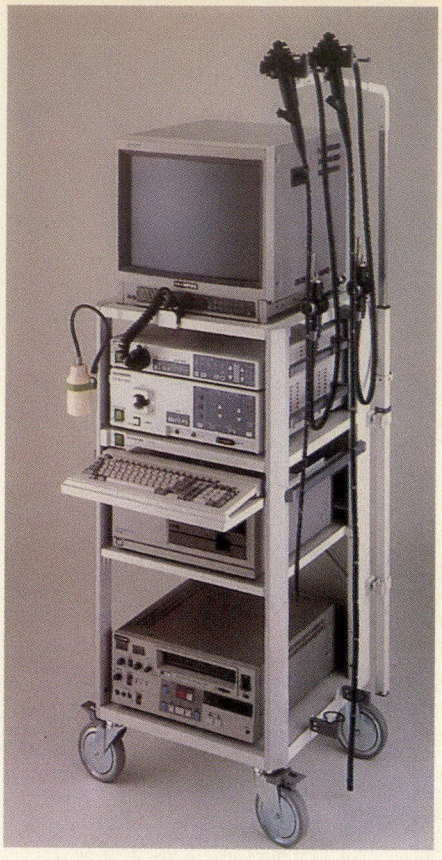

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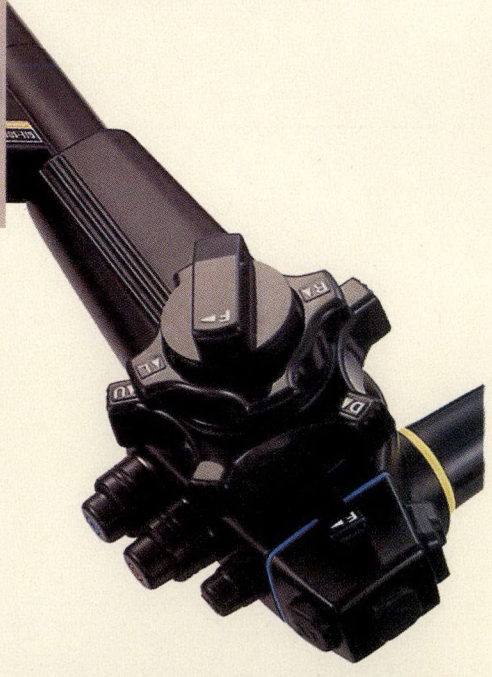

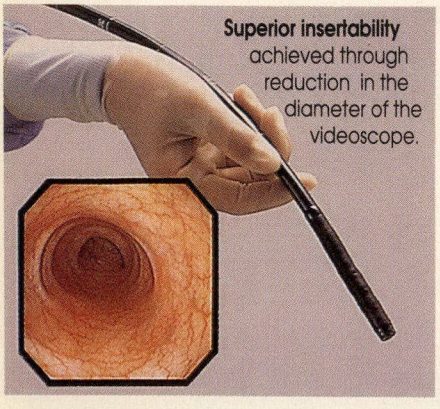

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Detailed instructions to contributors, in English and French, appear on pages 100 and 101 of the February 1993 issue.

CJS is printed by RBW Graphics, Owen Sound, Ont. and published every 2 months (February, April, June, August, October, December). Postage is paid at Owen Sound. Publications mail registration no. 5375. US 2nd-class postage paid at US Office of Publication: Champlain, NY (USPS no. 762–530).

Annual (1993) subscription rates for Canada: Royal College of Physicians and Surgeons of Canada, Canadian Association of General Surgeons, Canadian Orthopaedic Association, Canadian Society for Vascular Surgery, Canadian Society of Cardiovascular and Thoracic Surgeons and Canadian Society of Surgical Oncology members $25 (included in annual membership fee); nonmembers $58 ($32 for trainees in surgery in Canada only); for all other countries $63. Single copies (current issue) $9, back issues $10. (Note: in Canadian $ to Canadian addresses and in US $ to all other addresses.) Canadian orders are subject to 7% GST.

Address changes and requests for subscriptions: Information Technology, CMA, PO Box 8650, Ottawa, ON K1G 0G8. US address changes: *CJS*, PO Box 1518, Champlain, NY 12919–1518. *CJS* appears in the following indexing/abstracting services: *Index Medicus, Current Contents, Science Citation Index, Biological Abstracts, Chemical Abstracts, Excerpta Medica, Nutrition Abstracts and Reviews, Index to Dental Literature, Helminthological Abstracts* and *Index to Scientific Reviews.*

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On trouvera des renseignements détaillés aux contributeurs, en anglais et en français, aux pages 100 et 101 de cette livraison de février 1993.

Le *JCC* est imprimé par RBW Graphics, Owen Sound (Ont.) et publié aux 2 mois (février, avril, juin, août, octobre, décembre). Port payé à Owen Sound. Courier de publications nº 5375. Tarif postal 2e classe US; port payé au bureau de publication aux États-Unis : Champlain, NY (USPS nº 762–530).

Taux annuels d'abonnement pour le Canada (1993) : membres du Collège royal des médecins et chirurgiens du Canada, l'Association canadienne des chirurgiens généraux, l'Association canadienne d'orthopédie, la Société canadienne de chirurgie vasculaire, la Société canadienne des chirurgiens cardiovasculaires et thoraciques et la Société canadienne de chirurgie oncologique, 25 $ (compris dans les frais annuels d'adhésion); non-membres, 58 $ (32 $ pour les stagiaires en chirurgie au Canada uniquement); tous les autres pays 63 $. Exemplaires individuels (volume courant), 9 $; volumes antérieurs, 10 $. (Note : en devise canadienne aux adresses au Canada et en devise américaine à toutes les autres adresses.) Les commandes au Canada sont assujetties à la TPS de 7 %.

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Cemented and Uncemented Hip Implants in Patients With Rheumatoid Arthritis

James P. Waddell, MD, FRCSC

Department of Surgery, St. Michael's Hospital, Toronto, Ont. Member, Editorial Board Canadian Journal of Surgery

In this issue of the Journal (pages 229 to 232), Kirk and colleagues review their results of hip replacement in patients with rheumatoid arthritis. Orthopedic surgeons have always recognized patients with rheumatoid arthritis as a group with unique problems related to poor tissue healing, osteopenia, involvement of multiple joints and a propensity for prosthetic problems after joint replacement. It is significant that Kirk and colleagues have attempted to define the performance characteristics and contraindications for both cemented and uncemented total hip arthroplasty in this unique patient group.

Forty-two hips were replaced; 17 hips were cemented to the host bone, and 25 hip prostheses were dependent upon tissue ingrowth for fixation. The average follow-up for cemented hips was 5 years and for uncemented hips 3 years.

At follow-up, average Harris hip function scores in the two groups were comparable, with no significant difference. Rates of loosening and component migration as judged radiologically were also essentially the same in the two groups.

There have been concerns from a number of orthopedic surgeons that tissue ingrowth prostheses in patients with rheumatoid arthritis would be unsuccessful when compared with cemented prostheses. This is because of poor bone ingrowth in patients with rheumatoid arthritis and a greater propensity for migration due to underlying osteopenia and decreased bone metabolic activity caused by concomitant anti-inflammatory medication. Careful evaluation by the authors of these two groups of patients suggests that this concern is not valid and that solutions other than cementing could be considered in selecting the appropriate prosthesis for patients with rheumatoid arthritis involving the hip.

Although a 5-year follow-up is short in terms of durability and longevity for hip replacement, the fact that both groups had similar functional results and radiographic appearance suggests that there will be no dramatic differences in the foreseeable future. The use of uncemented implants for total hip replacement remains controversial because of a number of factors related to implant geometry, surface texture and periprosthetic osteolysis, which may be related to excessive contact between the endosteal surface and the metal alloy of the prosthesis. It would appear, based on this study, that the use of uncemented implants in rheumatoid arthritis poses no greater risk of complication than cemented implants in a similar patient group.■

Progress of Parathyroid Surgery in Canada

Nis Schmidt, MD, MSc, FRCSC

Clinical professor and director of surgical education, Department of Surgery, University of British Columbia, Vancouver, BC. Member, Editorial Board, Canadian Journal of Surgery

The first recorded successful parathyroidectomy in Canada was for end-stage von Recklinghausen's disease in a bedridden 17-year-old girl in Indian Head, Sask.[1] The procedure was performed under local anesthesia by Dr. Gordon Fahrni on May 1, 1933. A large 2.5-cm tumour was located deep to the left sternoclavicular joint and extracted through the neck incision. Dr. Fahrni, who celebrated his 106th birthday on Apr. 13, 1993, recounted this story to me again during a recent visit to his home. There are two important points to remember, he cautioned: first, the parathyroid tumour may not be in a patient's neck; and second, there is no reliable test to locate the tumour other than a confident diagnosis and a surgeon experienced in parathyroid exploration.

Sixty years after that first operation and in spite of sophisticated advances in chemistry, nucleotide science and imaging technology, all our best tests and efforts do not exceed the 80th percentile of diagnostic confidence and accuracy in localizing preoperatively the position of a parathyroid tumour in the neck.[2]

In 1929, Dr. Fahrni visited Felix Mandl in Salzburg, Austria. He was the person credited with understanding the relationship between von Recklinghausen's disease and parathyroid disease.[3] Since then, countless clinical studies have been reported, comparing the sensitivity and reliability of various imaging or localizing investigations of parathyroid tumours. Yet the most successful localizing procedure still remains a well-executed, methodical and usually successful parathyroid exploration.

In this issue (pages 241 to 244), Yao, Jamieson and Blend report a study comparing magnetic resonance imaging with isotope scanning and ultrasonography in preoperative localization of diseased parathyroid glands. They conclude that the low sensitivity and high cost of these preoperative localization study techniques render them unnecessary in the management of uncomplicated parathyroid disease. In my experience, I agree completely. Dr Fahrni agrees also. In complicated and reoperative parathyroid surgery, these investigations, especially ultrasonography followed by venous sampling and arteriography, are the most helpful localization studies available, but in first-time parathyroid exploration, surgical experience is still the best diagnostic tool available for localizing the parathyroid tumour.

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Interval Appendectomy

John K. MacFarlane, MD, FACS, FRCSC

Chairman, Department of Surgery, St. Paul's Hospital, Vancouver, BC. Member, Editorial Board, Canadian Journal of Surgery

In this issue (pages 268 to 270), Marya and colleagues examine the tradition of "interval appendectomy." They are to be congratulated on their thoughtful approach to solving the surgical conundrum posed by patients who have acute appendicitis producing an appendiceal mass. The traditional management of such patients evolved in the era of J.B. Murphy, when effective antibiotic therapy and appropriate and safe anesthesia were rare.

With the evolution of more aggressive surgical approaches to the acute gallbladder, to perforated diverticulitis and indeed to most intra-abdominal conditions, it is not surprising that the concept of waiting for the devolution of an appendiceal mass before removing the appendix has been challenged.

The 56 patients seen by the authors between 1989 and 1991 were managed either traditionally — by conservative treatment followed by interval appendectomy in 6 to 10 weeks — or by early appendectomy. Unfortunately, Marya and colleagues do not tell us how the choice was made, and this may introduce some bias to the conclusions. However, they have produced a convincing study, suggesting that early surgery is as efficient as the traditional conservative approach.

In three additional patients treated nonoperatively there was no follow-up, suggesting perhaps that their illness had resolved. Two other patients in the early operation group required surgical drainage of an appendiceal abscess, and appendectomy had to be postponed. Both groups of patients received the same antibiotic regimen.

The authors point to a slightly shorter overall hospital stay, a comparable postoperative infection rate and an earlier return to work for the early operation group as supporting this approach. A recent report from Nitecki and colleagues[1] lends further support to this concept; they have pointed out the utility of modern imaging techniques as further guides to therapy and have concluded that elective interval appendectomy should be a thing of the past.

Once more we see surgical dogma being challenged by thoughtful and aggressive surgeons. It is refreshing to know that safe, effective surgical alternatives exist for the expeditious management of intra-abdominal inflammatory processes such as appendicitis with production of a mass.

Reference

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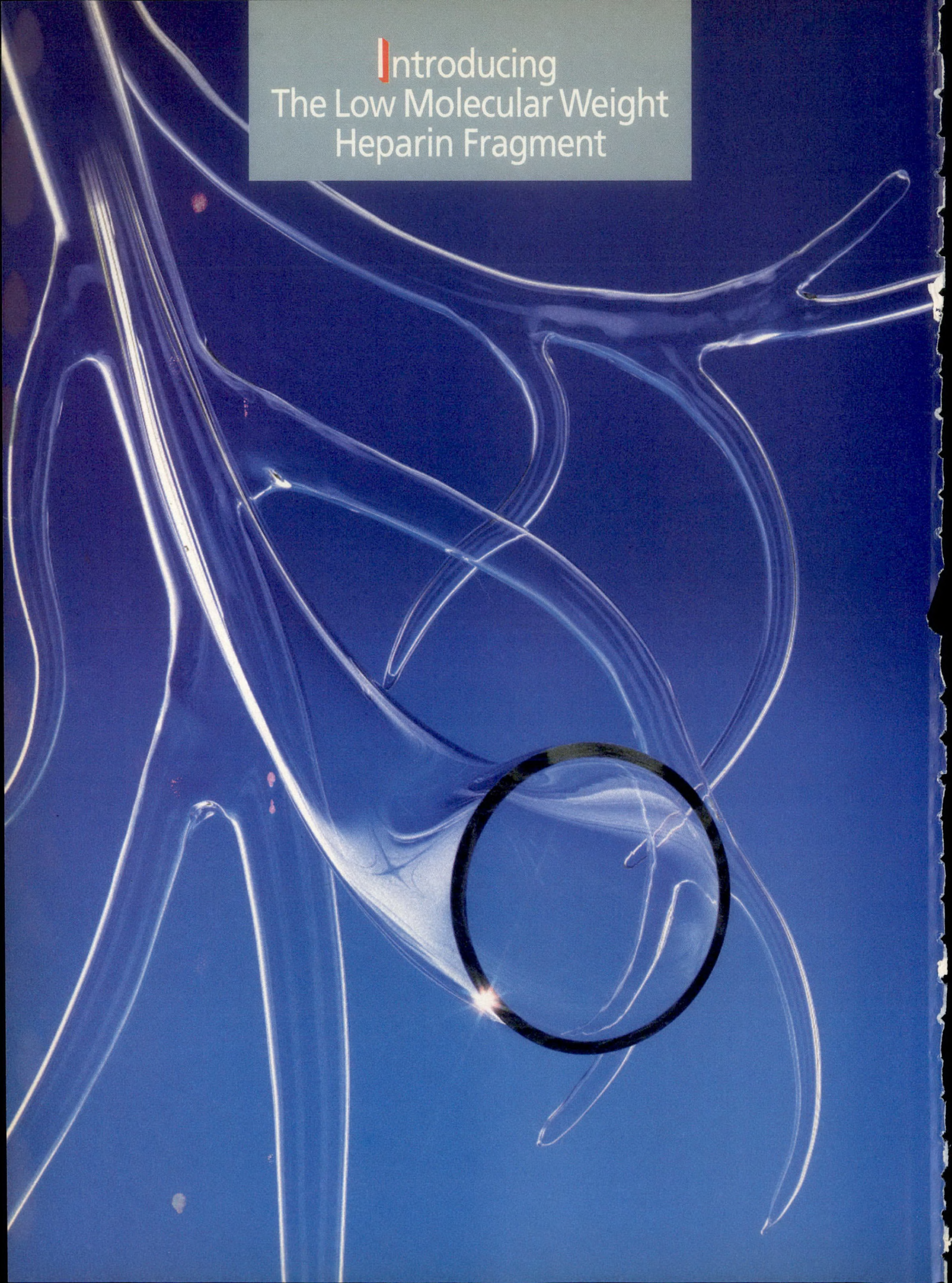
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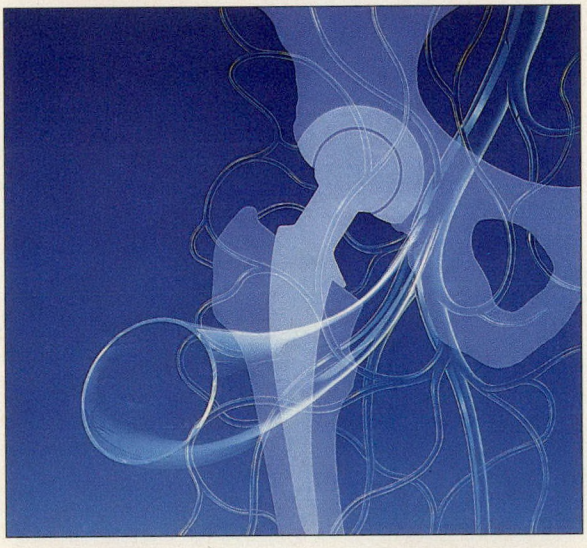

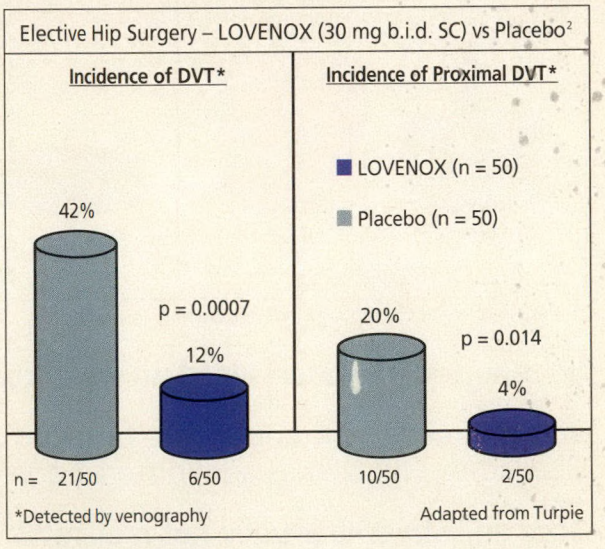

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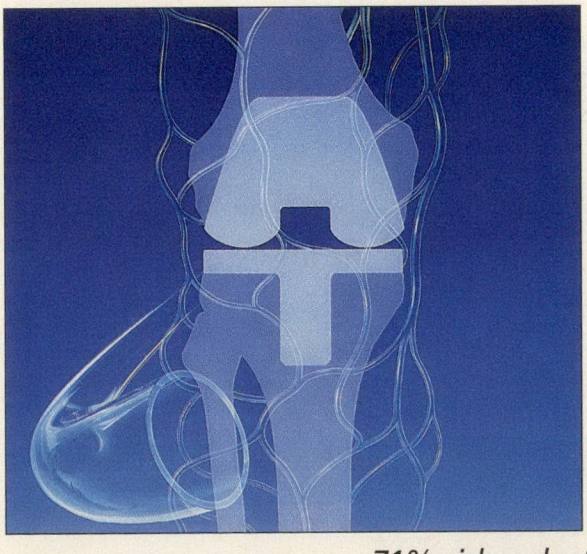

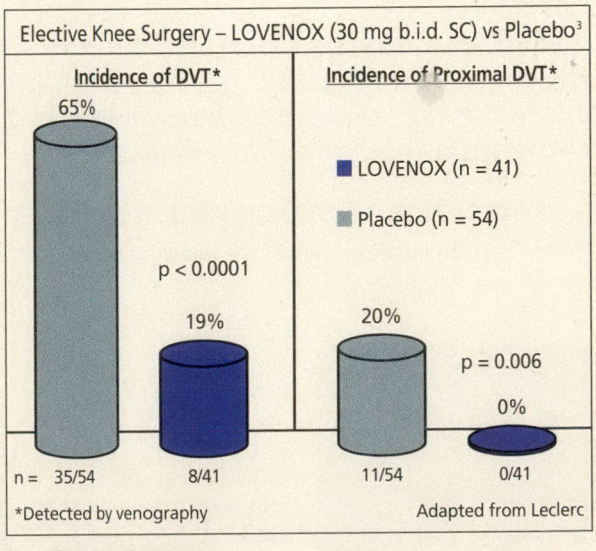

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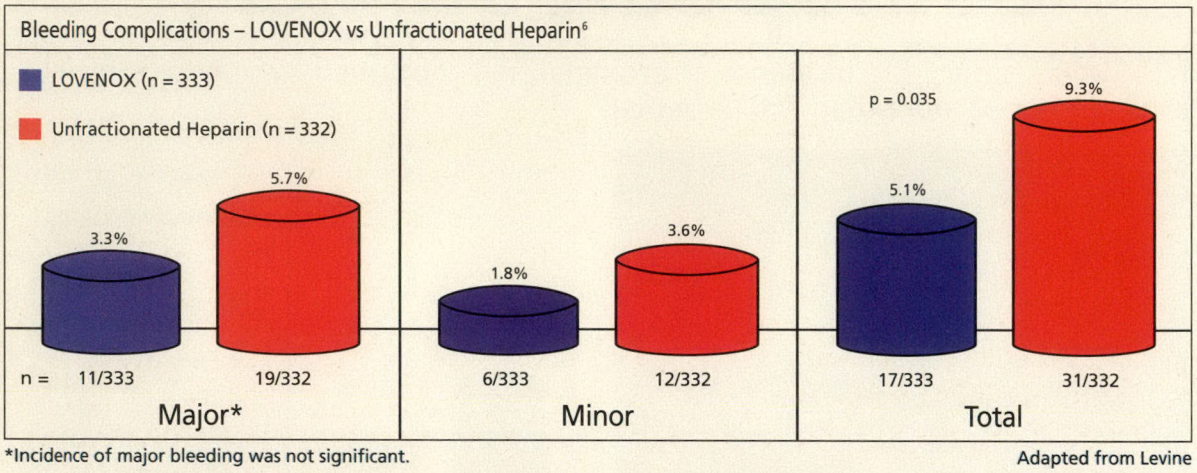

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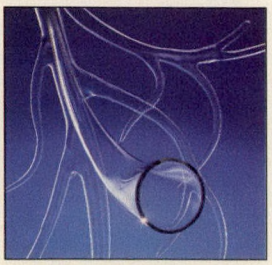

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Pharmacokinetics
The pharmacokinetics of enoxaparin have been studied on the basis of plasma levels of anti-Xa activity.

Following a single subcutaneous injection, enoxaparin is rapidly and almost completely absorbed, with peak plasma activity appearing after 3 hours. Maximum anti-Xa levels and AUCs are positively correlated to the dose levels: between the doses of 20 and 80 mg s.c., maximum anti-Xa levels range from 1.58 (±0.35) to 7.44 (±1.47) μg/mL and the AUCs range from 11.79 (±3.30) to 70.76 (±15.49) $h.\mu g.mL^{-1}$.

The $t_{1/2}$ of plasma anti-Xa activity is between 4.18 (±2.21) and 3.46 (±0.86) hours and the mean residence time (MRT) of anti-Xa activity is about 6 hours, independent of the dose (between 20 and 80 mg s.c.), although anti-Xa activity can still be measured after 12 hours.

Information from a clinical trial with a very small number of volunteers indicates that enoxaparin, as detected by anti-factor Xa activity, does not appear to cross the placental barrier, at least during the second trimester of pregnancy.

Following repeated subcutaneous doses of enoxaparin, the T_{max} for anti-Xa activity remained at 3 hours and there was no evidence of accumulation or alterations in distribution and clearance.

Enoxaparin is weakly metabolized in the liver by desulfation and depolymerization. Small amounts of the drug are eliminated by the kidneys in the intact or slightly degraded form.

In the elderly, peak concentration (T_{max}) was delayed by approximately 1 hour and there was some lengthening of both the apparent half-life ($t_{1/2}$) and the mean residence time (MRT). There were no significant changes in the pharmacokinetic profiles of enoxaparin in elderly patients or in hemodialyzed patients with renal failure when compared to those of healthy subjects.

The dose and frequency of dosing do not have to be modified in elderly patients or dialyzed patients with renal insufficiency.

In non-dialyzed patients with severe renal impairment (mean renal creatinine clearance: 11.4mL/min), total clearance of enoxaparin was 1.9 times slower and the apparent half-lives of absorption and elimination 1.7 times more prolonged than in healthy subjects. These effects suggest that dose modifications may have to be considered in patients with severe renal impairment who are not hemodialyzed, when repeated high doses are required.

INDICATIONS and CLINICAL USE
LOVENOX (enoxaparin) is indicated for the prophylaxis of thromboembolic disorders (deep vein thrombosis) following orthopedic surgery of the hip or knee.

CONTRAINDICATIONS
- -LOVENOX (enoxaparin) must **not** be administered by the intramuscular route.
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- -Acute or subacute bacterial endocarditis.
- -Major blood clotting disorders.
- -History of thrombocytopenia with LOVENOX or in patients in whom an *in vitro* platelet-aggregation test in the presence of enoxaparin is positive.
- -Active gastric or duodenal ulcer.
- -Hemorrhagic cerebrovascular accident (except if there are systemic emboli)
- -Severe untreated hypertension.
- -Diabetic or hemorrhagic retinopathy.
- -Other conditions or diseases involving an increased risk of hemorrhage.

WARNINGS
LOVENOX (enoxaparin) SHOULD BE USED WITH CARE IN PATIENTS WITH HEPATIC INSUFFICIENCY OR A HISTORY OF GASTROINTESTINAL ULCERATION.

Use in Pregnancy and Lactation and for Children. The safety of LOVENOX in pregnant women and children has not been established, although it is known that the drug does not appear to cross the placental barrier at least during the second trimester and that it exhibited no embryotoxic or teratogenic effects in experimental animals. LOVENOX should not be used in pregnant women and children unless the therapeutic benefits to the patients outweigh the possible risks.

There has been no experience with LOVENOX during human lactation. Mothers receiving LOVENOX should avoid breast-feeding.

PRECAUTIONS
LOVENOX therapy should be stopped when epidural anesthesia is considered.

Patient Monitoring
Platelet counts should be determined prior to the start of treatment with LOVENOX and, subsequently, twice weekly for the duration of treatment.

LOVENOX represents an alternative to heparin therapy in patients who have developed thrombocytopenia with conventional heparin. Prior to instituting LOVENOX, an *in vitro* platelet aggregation test should be performed. Although this test is considered to have limitations, it may still be used as a guide: with a negative result, treatment with LOVENOX may be instituted, but patients must be monitored with particular care, to include platelet counts at least once daily. A positive result contraindicates LOVENOX.

As with all anti-thrombotic agents, there is a risk of systemic bleeding with LOVENOX administration. Patients should therefore be carefully monitored for bleeding complications. This may be done by regular physical examination of the patients, close observation of the surgical drain and periodic measurements of hemoglobin. Bleeding complications may be considered major if hemoglobin is decreased by ≥ 2g/dL or if a transfusion of 2 or more units has been required. With normal prophylactic doses, LOVENOX does not modify global clotting tests of activated partial thromboplastin time (APTT), prothrombin time (PT) and thrombin clotting time (TT). Therefore, treatment can not be monitored with these tests.

Interactions. There have been no pharmacologic/toxicologic studies into the possible interaction between LOVENOX and other drugs. Because of the possibility of an interaction with blood clotting mechanisms, caution should be exercised if LOVENOX is combined with any of the following drugs: oral anticoagulants, inhibitors of platelet aggregation, nonsteroidal anti-inflammatory agents, preparations containing acetylsalicylic acid or dextran.

ADVERSE REACTIONS
As with any antithrombotic treatment, hemorrhagic manifestations can occur. The incidence of hemorrhagic complications during LOVENOX (enoxaparin) treatment has been low.

The following bleeding events have been reported during clinical trials with LOVENOX in patients undergoing orthopedic surgery. Numbers in brackets denote the total incidence (in numbers of patients) for a population of 449 patients.

Coagulation System Adverse Effects	No. Patients (Incidence) "Major"*	"Minor"
Surgical wound hematoma	6 (1.3%)	2 (0.4%)
Surgical wound hemorrhage	1 (0.2%)	0
Bruising	2 (0.4%)	2 (0.4%)
Hematoma	1 (0.2%)	2 (0.4%)
Hematemesis	1 (0.2%)	1 (0.2%)
Nosebleed	0	2 (0.4%)
Melena	1 (0.2%)	0
Coffee ground emesis	1 (0.2%)	0
Hematuria	1 (0.2%)	1 (0.2%)
Hemoptysis	0	1 (0.2%)
Oozing from wound site	0	1 (0.2%)
Ecchymoses	0	1 (0.2%)

* "Bleeding complication considered major if hemoglobin decreased by ≥ 2g/dL or if a transfusion of 2 or more units was required."

During Canadian clinical trials with LOVENOX, thrombocytopenia was reported in rare instances (0.4% of treated patients); see PRECAUTIONS.

Other adverse effects which occurred during treatment with LOVENOX are tabulated below:

Body System/Adverse Effects	No. Patients (Incidence)	
Body as a Whole		
Leg pain	1	(0.2%)
Pain in hip	2	(0.4%)
Fever	1	(0.2%)
Cardiovascular		
Arrhythmia	1	(0.2%)
Tachycardia	1	(0.2%)
Postural dizziness	1	(0.2%)
Unstable angina	1	(0.2%)
Hypotension	1	(0.2%)
Syncope	1	(0.2%)
Decreased arterial pressure	1	(0.2%)
Digestive		
Vomiting	2	(0.4%)
CNS		
Confusion	1	(0.2%)
Respiratory		
Dyspnea	2	(0.4%)
Chest pain	3	(0.7%)
Hypoxia	1	(0.2%)
Metabolic and Nutritional		
Leg edema	11	(2.4%)
Knee edema	2	(0.4%)
Foot edema	2	(0.4%)
Ankle edema	2	(0.4%)
Edema	1	(0.2%)
Leg swelling	1	(0.2%)
Pitting edema	1	(0.2%)
Skin/Appendages		
Wound edema	4	(0.9%)
Discharge of surgical wound	4	(0.9%)
Injection site reaction	2	(0.4%)
Inflammation of incision	2	(0.4%)

Laboratory Tests: Values for hemoglobin, hematocrit, RBC and platelets generally decreased following surgery and during treatment with LOVENOX. These decreases generally parallelled those seen in placebo-treated patients and were considered the normal sequelae of major surgery; the observed mean values remained within clinically acceptable levels.

Increases in values for glucose and liver enzymes have also been reported during treatment with LOVENOX. While these responses may be related to the anesthetic and the various stresses related to major surgery, their relation to the drug cannot be excluded. The following tabulation illustrates the incidence of such abnormalities:

Parameter	No. Patients (Incidence) ≥ 3 times normal maximum		≥ 6 times normal maximum	
LDH	2	(0.4%)		
SGOT	4	(0.9%)		
SGPT	7	(1.6%)	3	(0.7%)
Alkaline Phosphatase	4	(0.9%)	1	(0.2%)
Glucose	1	(0.2%)		
Total bilirubin	1	(0.2%)		
Unspecified liver enzymes	10	(2.2%)		

SYMPTOMS and TREATMENT OF OVERDOSAGE
Accidental overdosage of LOVENOX (enoxaparin) by subcutaneous administration may result in hemorrhagic complications. The anti-coagulant activity of the drug can be neutralized almost completely by administering a slow intravenous injection of protamine (either the sulfate or hydrochloride salt). The dose of protamine should be identical to the dose of enoxaparin injected, that is, 1 mg or 100 units of protamine to neutralize the anti-IIa activity generated by 1 mg LOVENOX. The anti-Xa activity is never completely neutralized (maximum: about 60%). Particular care should be taken to avoid overdosage with protamine.

DOSAGE and ADMINISTRATION
Treatment with LOVENOX (enoxaparin) should begin within the first 24 hours following orthopedic surgery, as soon as primary hemostasis has been established. Administer the contents of one syringe every 12 hours, equivalent to 30mg enoxaparin b.i.d., by the subcutaneous route in the abdomen. The usual duration of treatment is from 7 to 14 days.

The subcutaneous injection of LOVENOX should be carried out with the patient in the decubitus position. Inject in the subcutaneous cellular tissue of the anterolateral and posterolateral abdominal girdle, alternatively on the left and right sides. With the thickness of skin held between the operator's thumb and finger, introduce the entire length of the needle vertically into the skin.

Important: The prefilled syringes are ready for use and no attempt should be made to expel air prior to giving the injection.

LOVENOX is not to be injected by any other route or added to intravenous solutions.

Under normal conditions of use, LOVENOX does not modify global clotting tests of activated partial thromboplastin time (APTT), prothrombin time (PT) and thrombin clotting time (TT). Therefore treatment cannot be monitored with these tests. The plasma levels of the drug can be verified by measuring anti-Xa and anti-IIa activities.

AVAILABILITY OF DOSAGE FORMS
Prefilled syringes: 30 mg/0.3 mL in boxes of 10 syringes, each in an individual blister pack.

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Hematuria and Intravenous Pyelography in Children After Blunt Renal Trauma

To the editors. The article by Middlebrook and Schillinger (*Can J Surg* 1993; 36: 59–62), in which they discuss hematuria and intravenous pyelography in pediatric blunt renal trauma, requires comment.

In view of the small number of children studied, unfortunately without any statistical analysis, the conclusions are somewhat doubtful. It would have been interesting to know the total number of intravenous pyelograms obtained for trauma during the period under investigation. The authors also refer to a greater propensity for children to have pedicle injuries but report no such injuries in their series.

Some statements require revision. For example, if the authors are managing children who are 2 years of age, then a systolic blood pressure below 100 mm Hg may well be normal and not indicate hypotension. They mention that most of the injuries in the major group in their Table III were identified by intravenous pyelography. More information about the diagnosis of hepatic and splenic injuries, head injuries, thoracic injuries, and so on and their diagnosis by intravenous pyelography should have been given. Furthermore, in the discussion section the authors mention that 73% of patients with traumatic hematuria have significant other abnormalities that were missed by intravenous pyelography. The minimal use of ultrasonography, especially with Doppler, in this study detracts from the value of the study, since ultrasonography at the Children's Hospital of Eastern Ontario is usually the first diagnostic test to be done in cases of abdominal trauma. A comparison between ultrasonography, intravenous pyelography and computed tomography would have been more useful.

In the last part of their study, Middlebrook and Schillinger look at cost saving. For this reason, their choice of bed rest in hospital for the management of patients with normal findings on intravenous pyelography and minimal hematuria needs to be questioned.

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The Case of Canadian General Surgeons

To the editors. In the April 1993 issue of the Journal (pages 111 to 113), Marvin Wexler, president of the Canadian Association of General Surgeons (CAGS), in responding to the article by Railton, Tholl and Sanmartin (pages 129 to 132), contends that the Canadian Medical Association (CMA) ". . . must make a commitment to general surgery to lobby politically and economically on behalf of that specialty and to forget the concept of a unified voice for all physicians." In so doing, he further suggests that the CMA take the lead from the American Medical Association in going to bat for Canadian general surgeons on compensation issues. Clearly, there is a fundamental misunderstanding of the message being sent by Railton, Tholl and Sanmartin and of the role of the CMA.

There is no doubt that the CAGS has been playing an active role for a number of years in voicing and addressing the concerns of general surgeons on issues of national importance. Indeed, that fact that Railton, Tholl and Sanmartin published their work is evidence that this message getting through and that it is being factored into the development of CMA policies at a national level. To suggest that the CMA preferentially promote the cause of general surgeons in discussions about Relative Value Guides is to dismiss the exclusive role of the CMA's divisions on matters of fee relativities. Such matters are, constitutionally, a provincial/territorial jurisdiction! The primary role of the CMA is, quite properly, to search for consensus across all its provincial and territorial divisions and affiliates, including the national specialty societies; that is, to serve as an honest broker and a national voice of medicine.

On the national scene, it is vitally important that the medical profession speak with one voice if its message is to be heard by governments who are working increasingly in concert on issues such as physician resources. This is why the CMA engaged in an unprecedented process of consultations before preparing its position on national physician resources planning to the Conference of Health Ministers on

Jan. 27, 1992. The CAGS, as well as other national medical bodies, had an opportunity to be heard on this issue and will continue to be consulted on other matters of national importance.

In terms of the message to individual general surgeons across the country that they need to "get involved," there is little doubt that provincial governments are moving aggressively toward regionalized and decentralized management approaches to the health care system, including management of physician resources. General surgeons and other bodies of the medical profession must ensure that their legitimate concerns and interests are represented at this level as well. The CMA cannot and should not be expected to intervene actively at the regional or provincial level. All it can do is help bodies within the medical profession to carry their message by providing the kind of information that Railton, Tholl and Sanmartin have captured in their article.

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BOOK REVIEWS
CRITIQUES DES LIVRES

The following books are also reviewed in this issue: **Diagnosis of Colorectal and Ovarian Carcinoma. Application of Immunoscintigraphic Technology (Targeted Diagnosis and Therapy Series/6)** (page 265); **Surgery: Scientific Principles and Practice** (page 270); **Clinical Pediatric Urology**, 3rd edition (page 280); **Complications in Head and Neck Surgery** (page 283); **Atlas of Gynecologic Surgery** (page 283); **Tracheal Reconstruction in Infancy** (page 284); **Atlas of Laparoscopic Surgery** (page 284).

OPERATIVE UROLOGY. Edited by Fray F. Marshall. 631 pp. Illust. W.B. Saunders Company/Harcourt Brace Jovanovich, Inc., Philadelphia. 1991. $162. ISBN 0-7216-6121-1

Textbooks on operative technique can be tedious, if not boring, so it was with some degree of trepidation that I set out to review this long text on operative urology, edited by Dr. Fray Marshall. However, after promising myself to keep an open mind and setting a course through the pages, I was pleasantly surprised.

This book covers the full range of current operative management of urologic problems. The text is divided into five sections with arguable indistinct areas of focus: adult surgery, outpatient surgery, pediatric surgery, surgery for trauma, and endoscopic surgery and extracorporeal shock wave lithotripsy. In 85 chapters, a total of 92 authors present their areas of expertise. As in any text by multiple authors, the quality of individual chapters varies. Attention is focused on preoperative evaluation, surgical technique, postoperative management and complications.

In general the procedures are well illustrated by clear line drawings, although there are scattered intraoperative photographs and figures showing the radiologic findings. Each chapter gives the individual author's preferred approach and is therefore a biased account rather than an all-inclusive treatise on the topic presented. References supporting the text vary from none to many. Brief editorial comments are provided after most chapters, emphasizing critical points of technique and supplementing with clinical "pearls" of experience.

As I reviewed this book it became a friendly companion for reference, especially before infrequently performed surgical procedures. Unlike other textbooks of urologic surgery, this one is concise enough to allow reading between cases and sufficiently up to date to prevent embarrassment while at the mercy of a keen chief resident. Overall, this book is ideally suited for both practising urologists and urologists in training who are looking for a reliable reference to operative urology. I would not recommend it to the neophyte.

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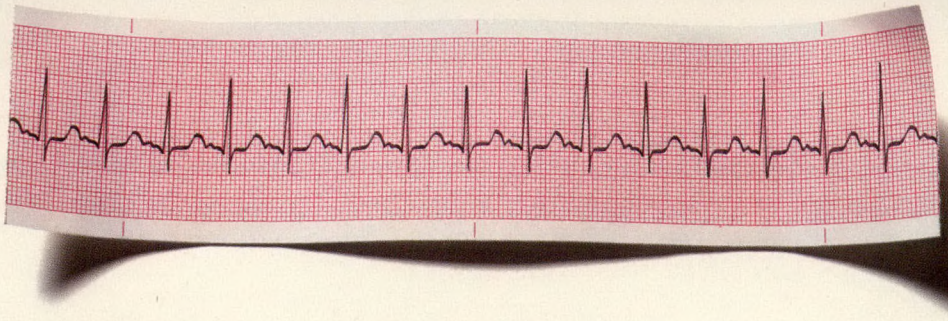
WYLIE'S ATLAS OF VASCULAR SURGERY: COMPLICATIONS REQUIRING REOPERATION. Vol. 1. Ronald J. Stoney and David J. Effeney. 208 pp. Illust. J.B. Lippincott Co., Philadelphia. 1991. $150 (US). ISBN 0-397-50971-5

Based on the experience and expertise of two experienced vascular surgeons from the University of California at San

continued on page 265



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Technique for Needle Localization Biopsy of the Breast

Paul H. Niloff, MD, FACS, FRCSC;* Steven G. Goff, MD, FACS;*
Donald Dewar, MD;† Donald Bane, MD†

With the increased use of mammography, needle localization with excision of abnormal tissue has become one of the most frequently performed procedures in breast surgery. One of the difficulties often encountered has been satisfactory placement of the incision over the hook wire tip. Compression techniques,[1] sonography[2] and intraoperative fluoroscopy[3] have been advocated to achieve satisfactory placement of the incision. If the localizer needle is left in situ until the patient is in the operating room, the needle tip may be palpated and an appropriate incision selected to achieve the best cosmetic result. Both hook wire and methylene blue have been used for the localization procedure, and each has its proponents.[4–6] We use a combination of hook wire and dye, which allow the accurate removal of a minimum amount of tissue, contributing to the cosmetic result.

Technique

All women are outpatients, and the procedure is done under local anesthesia with monitored anesthesia care. After the radiologist has placed the localizer needle in its final position, 0.2 to 0.3 mL of a mixture of 76% iodinated contrast and methylene blue in a 50:50 ratio in a tuberculin syringe is injected. A spring hook (Copan needle) is then placed through the localizer needle (Fig. 1). A post-insertion mammogram is obtained to confirm the location of the radiopaque dye and the hook wire (Fig. 2). The localizer needle is then securely taped to the breast with Steri-Strips (Fig. 3). Before transport to the operating room, the needle is covered with a plastic cup securely taped to the breast as an added precaution to prevent dislodgement (Fig. 4). The cup and Steri-Strips are removed in the operating room by the surgeon. The localizer needle tip is easily palpated, and the area is delineated with a marking pen, facilitating an

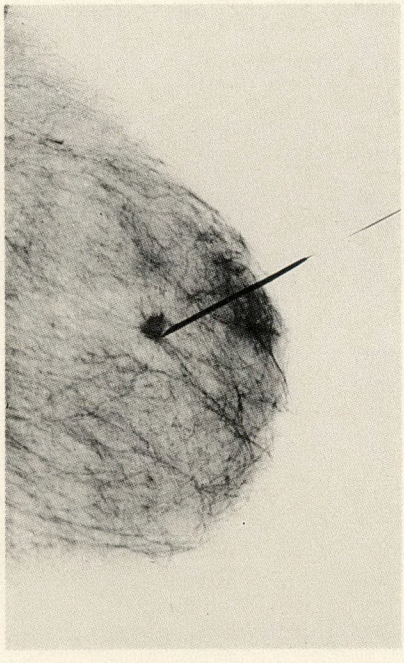

FIG. 1. Needle localization of mammographic abnormality.

FIG. 2. Post-insertion mammogram.

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Accepted for publication Nov. 2, 1992

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appropriate incision (Fig. 5). The localizer needle is then removed and the patient prepared for operation (Fig. 6).

Comment

We have used this technique for over 5 years with gratifying results. There have been proponents of both the hook wire and methylene blue techniques;[1,2,4] in our experience, a combination of the two techniques with the addition of radiopaque dye has resulted in accurate removal of the mammographic lesions with a minimal amount of tissue. The presence of the dye is particularly beneficial if the hook wire becomes dislodged as can sometimes happen in soft, fatty breast tissue. With minimal delay in starting the procedure after dye injection, unsatisfactory results due to dye dispersion have not been a problem. If the localizer needle is left in place until the patient is in the operating room, a precise, cosmetically acceptable incision can be made without the need to follow the needle tract or dye tract from the point of skin insertion. We have not experienced any problems with needle dislodgement during transport.

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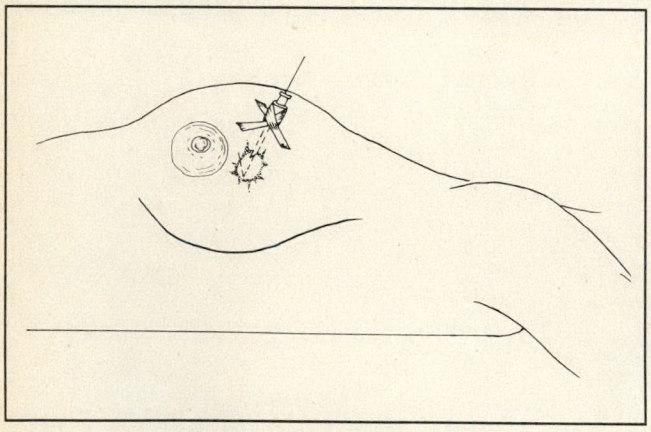

FIG. 3. Localizer needle taped to skin for fixation.

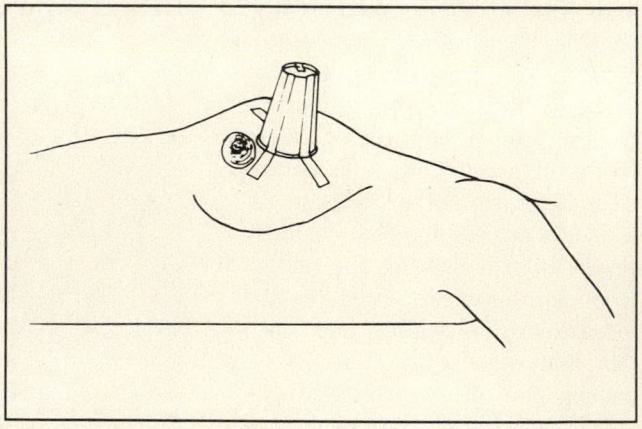

FIG. 4. Cup taped over localizer needle.

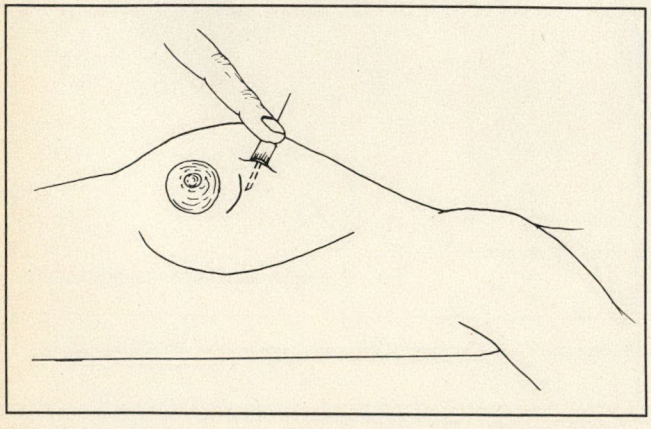

FIG. 5. Palpation of point of localizer needle and placement of incision.

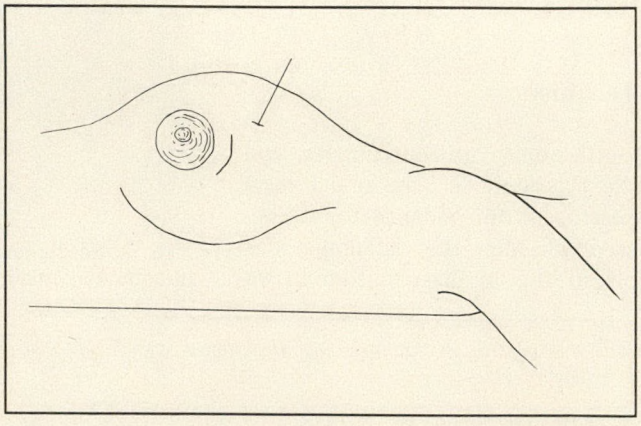

FIG. 6. Localizer needle removed.

Presidential Address, 1992. Life and Times of an Urban Surgeon, Circa 1990

Frank W. Turner, MB, ChB, MSc, FRCSC, FACS

After considering some of the successes and failures of the Canadian Association of General Surgeons as they relate to the nonacademic surgeon, the author describes in detail the practice of one nonacademic urban surgeon to provide a historical record and a guide to the educational needs of such surgeons. He compares academic and nonacademic surgical practice, emphasizing the perhaps unrecognized benefits of the latter. Future change in nonurban general surgical practice is postulated.

Après avoir examiné certains des échecs et des réussites de l'Association canadienne des chirurgiens généraux dans la mesure où ils sont liés au chirurgien non enseignant, l'auteur décrit en détail la pratique d'un chirurgien non enseignant en milieu urbain pour constituer un historique et un guide des besoins en formation de tels chirurgiens. Il compare l'exercice de la chirurgie en milieu universitaire et ailleurs, en insistant sur les avantages peut-être méconnus des autres secteurs de pratique. Il fait état des changements qui vont toucher l'exercice de la chirurgie générale en région rurale.

It is an honour and a privilege to address you today.

Casting around for a topic on which to speak to you, my first thought was to debate the relevance of the Canadian Association of General Surgeons (CAGS) to the "run-of-the-mill" practising general surgeon. I have been actively involved in the CAGS in one form or another since its inception in 1977. I have watched as it has striven to become the voice of general surgery in Canada, and there have been many successes, particularly in the field of education. Yet it remains a truism that about one-third of the general surgeons in this country see no need to belong to the CAGS and many of those who do belong wonder just what the Association does for them. This problem, I believe, is almost insurmountable in a country divided into provincial jurisdictions, because what is perceived to be lacking is political clout, and that we do not have.

The day-to-day concerns of the working surgeon revolve around beds and operating time, which are strictly local matters, around income, which is a provincial matter, and around image and preservation of territory, which *are* matters for our Association. We have paid lip service to improving the image of the general surgeon but have in fact done little about it. Many of our members do not see it as a problem, and perhaps they are right. In view of the ongoing struggles with government that consume every physician's thoughts these days, perhaps our image is unimportant. Yet in the past we have lost out at the bargaining table because we are perceived as doing routine, humdrum work and have received little

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Accepted for publication Apr. 6, 1993

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or no recognition for the hours we keep or for the acuity of many of our patient's illnesses. Our name is no help — how many of the public can distinguish between a general surgeon and a general practitioner, who frequently lists his or her skills as both physician and surgeon? How many of us have not been asked "Are you a specialist?" In future negotiations with government it is going to be particularly important that we are recognized for what we are — highly trained surgical specialists. Of some note, Barer and Stoddart in their widely quoted report[1] had trouble with this: they referred to the need for more "generalist specialists." Perhaps we need a new name, but I have yet to hear one that is both apt and brief.

The problem may solve itself as we become conscripts of the civil service. I believe pay scales are based on qualifications, years of training, special skills, and so on, as well as on hours worked. Perhaps our time is coming!

The need to defend our turf has been addressed by the Association, but I am disturbed by the proliferation of narrow subspecialties and the impact that this has outside the larger teaching hospitals. I recognize the desire of people with similar interests to band together to promote knowledge in their field, but it is incumbent upon them to propagate such knowledge for the benefit of patients in nonacademic hospitals. It is absurd, for example, to expect that only a colorectal surgeon is fit to do proctologic surgery. Yet hospital credentialling committees and referring practitioners are prone to misunderstand such certification, seeing it more as a paper that excludes others rather than denoting its holder as having a special interest.

As an aside, I would point out one disadvantage of such superspecialization, and again I will use the colorectal surgeon as an example. I refer to the advent of laparoscopic colonic resections, which are increasingly being done by those who have honed their skills doing laparoscopic cholecystectomy and appendectomy. Such skills are not easily acquired, and colorectal surgeons may find themselves trailing well behind in a field in which they are supposed to be leaders.

The Nonacademic Urban Surgeon

There is one thing that I have done which most of you have not, and that is to switch ships in midstream, plunging from the stately barge of academia to the rocky raft of community surgery. Some of you will know that I practised for 14 years on the staff of a university hospital and then, for a number of reasons that are not germane to this discussion, moved to a much smaller urban community. This, I believe, gives me a unique perspective, which I would like to share with you.

First, I have a word or two to offer on the widely used but rarely defined term "community surgeon." Generally used to imply a nonacademic surgeon who works in a smaller urban or rural community, such use of the term has led to much confusion and misunderstanding, particularly in the debates that rage as to appropriate training. A community is, after all, defined as a social group of *any* size whose members reside in a specific locality, share government and have a common cultural and historical heritage. We are therefore all community surgeons and should abandon this term as a means of designating those who work in small nonurban communities.

Barer and Stoddart[1] suggested that "the culture of tertiary care centres re-enforces the view that practice in smaller communities implies second class medicine." Again, we are led to believe that there exist only two extremes — the tertiary care centre and the small community. What is being ignored is the reality that most of us work in neither of these extremes but in the huge middle ground of the nonacademic urban hospital.

On occasion since departing the world of academic surgery, I have been asked by residents just what it is like "out there." They seem surprised when I say it really isn't much different. I thought therefore that a look at just what I did, surgically speaking, might help to bring into focus what is expected of a nonacademic urban-based general surgeon. I also thought it might be interesting to document this as we come to the end of fee-for-service practice in Canada, for that is surely what is happening as governments seek to control medical costs.

Choices and Restrictions

Let me state right away that no practice is typical. We all have personal quirks that affect our choice of work. For example, I have declined to do vasectomies for no better reason than I can't be bothered. Other choices are to some extent the result of circumstance; we have skilled orthopedic and plastic surgeons available so why dilute the field of hand surgery even further? Some of my colleagues work much harder than I from choice, so the numbers I present cannot be interpreted as a standard.

I live and work in a community of 70 000 with a referral base of at least twice that number. The hospital has about 400 acute care beds, 6 active operating rooms, 8 anesthetists and 27 surgeons of whom 5

practise only general surgery. Two more do mostly vascular surgery but fill in with general surgery in times of famine. We have orthopedic surgeons, urologic surgeons, plastic surgeons, gynecologic surgeons and a neurosurgeon, so we almost never have to stray seriously outside our specialty. Apart from choice, my ability to work is limited by the availability of operating time; I have no designated beds, but with the increased usage of outpatient and short-stay facilities the limiting factor continues to be operating time. As I speak today I have about 100 patients awaiting surgery. For example, patients scheduled for elective cholecystectomy currently wait up to 6 months for admission to the short-stay unit.

Surgical Workload, 1990

For this record, I reviewed the year 1990, the last year before the advent of laparoscopic surgery in our community. During that year I took 6 weeks off work for holidays and 2 weeks for maintaining competence. In addition, our hospital responds to budgetary shortfalls by closing operating rooms, and I would estimate a further 2 weeks were lost because of this restriction.

In 1990 I was referred a total of 663 new patients, two-thirds of whom were seen in the office and one-third in the hospital. I carried out 461 major procedures in the operating room. In addition, I assisted other surgeons on 58 occasions. This can be a most instructive experience and one that is frequently lacking in the teaching hospital. The opportunity to work with surgeons trained in different schools doing things in ways you never would can be fascinating — especially when their patients seem to do just as well as your own despite the "errors" that were committed. This need for assistance also provides an opportunity to work outside the field of general surgery and, if nothing else, allows a glimpse of just how much of the operating-room budget is consumed by prosthetics and equipment in other specialties.

I will not detail all the procedures done — my aim is simply to indicate the scope and balance of one surgeon's practice. As you might expect, the bills were paid by "hernias and gallbladders" (Table I). Breast surgery is also a major component. Bowel surgery looms large in my recollection, but the figures don't meet my expectations! Pancreatobiliary procedures were poorly represented in 1990. Gastric procedures as you might expect are now much less common. Head and neck procedures, in my opinion, remain in the realm of general surgery. Anorectal and perineal disease were not major problems. Miscellaneous but fun-to-do procedures included adrenalectomy, splenectomy for hematologic disease and surgical reduction of intussusceptions.

Table I. Surgical Procedures Performed During 1990

Procedure	No.
Herniorrhaphy	115
Cholecystectomy	66
Appendectomy	23
Breast	
Breast biopsy (with or without localization)	63
Partial or total mastectomy	26
Axillary dissection	24
Gynecomastia excision	5
Colorectal	
Right hemicolectomy	12
Left hemicolectomy	4
Anterior resection	8
Abdominoperineal resection	6
Proctocolectomy and/or total colectomy	4
Hartmann's procedure	2
Miscellaneous resections for Crohn's disease	8
Laparotomy for obstruction	12
Pancreatobiliary	
Cholecystojejunostomy	2
Choledochojejunostomy	4
Pancreatic resection	2
Pancreatic drainage	2
Gastric	
Gastrojejunostomy	4
Gastric resection	6
Pyloroplasty	1
Vagotomy	3
Fundoplication	3
Head and neck	
Thyroidectomy	16
Parathyroidectomy	11
Parotidectomy	2
Congenital neck cysts	2
Pharyngoesophageal diverticulectomy	1
Anorectal and perineal	
Hemorrhoidectomy, fissurectomy	12
Transanal excision of rectal tumours	3
Excision of pilonidal sinus	5
Miscellaneous	
Adrenalectomy	2
Splenectomy (hematologic disease)	2
Intussusception	2

Notable by its infrequency was venous surgery, our vascular surgeons having commandeered that field. Notably, I did not do any orthopedic, urologic or neurologic surgery. In the course of other procedures I did carry out three salpingo-oophorectomies and one hysterectomy.

Also notable by its absence was endoscopy. Although we occasionally slip a gastroscope down in the operating room and do not regard this as requiring any skill not ordinarily available to a surgeon, I belong to the generation that mistakenly did not have time for endoscopy and had left the work to others. The CAGS has, of course, taken a very active role in remedying this error.

Academic Versus Nonacademic Urban Hospitals

So wherein lie the differences between the work I do and that of surgeons in tertiary care centres? The most obvious difference is in balance, witness the number of hernia repairs. More importantly, in the nonacademic urban hospital we are not burdened with the mishaps of "elsewhere general" or with the

general surgical emergencies developing in patients on specialized units such as cardiac and transplant units. Strangely, there is relatively little trauma. We do have motor vehicles, but most of the injuries in those who survive motor vehicle accidents seem to involve the head or limbs. Personal violence is not common in our community and what there is seems to be carried out with knives rather than guns.

Now to the pleasures of practising outside a teaching hospital. My colleague, Dr. Charles Lye, in his presidential address to the Canadian Society of Vascular Surgeons in 1991, said "Community surgery is less hectic than academic surgery, if only because one's agenda is more focused. Patient care is generally the only major concern" (personal communication, 1992). Deadlines for lectures, clinical presentations, publications, grant applications and so on do not interfere with the primary function of patient care.

The lack of students and housestaff also brings about a significant reduction in stress. In the teaching hospital setting, I came to know and respect a large number of fine young doctors, and I do not wish to demean them. Their company was stimulating and it was rewarding to help them attain their surgical skills. But, there is no doubt that it is more efficient and less stressful to work without them. Overall I think that patients are better served by the undivided care of their attending surgeon. When problems occur, solutions are sought immediately from the surgeon in charge and do not have to work their way through several layers of housestaff. Surprisingly, there are few night calls — probably because of anticipation by the surgeon and increased self-reliance on the part of the nursing staff in the absence of housestaff.

In the operating room, assistance is provided by another surgeon for the more difficult procedures. A second assistant is almost never required; a good mechanical retractor does all that a second assistant can do and never tires. Operating times are relatively short, which I firmly believe is to the patient's benefit. To document this, I looked at the skin-to-skin times of two representative procedures, in each instance taking the last 10 consecutive cases, whether fat or thin patients, male or female (Table II).

Of incidental note, our x-ray technicians provide excellent support and are usually in the room exactly when needed.

Before I moved to Kelowna, Roger Cumming, with whom I was to share a practice, warned me that my patients would "do better in the smaller hospital," and so it seems. Complications are rare enough to be a source of great consternation when they do occur. This apparent well-being is, of course, strictly subjective, and it may be that similar patients now do just as well in teaching hospitals. We all use antibiotics more intelligently, provide better pain control and, at least in my own case, have learned how infrequently nasogastric tubes and drains are really needed. More and more surgery is done on an outpatient basis, and even those patients who are admitted stay for a much shorter period which, despite the occasional family protest, seems to be to their benefit.

For those with a research bent, it is possible to carry out clinical trials in smaller hospitals, either by contributing patients to large multicentre trials or by making up your own. There tends to be less paper to shuffle and fewer committees to convince. For example, I have long doubted the value of the ritualistic antiseptic skin preparation that is so universally a part of the operating-room routine. We have all observed that clean lacerations in unprepared healthy skin rarely become infected. So Dr. Cumming and I simply arranged that on our patients who were to undergo clean elective surgery, an antiseptic skin preparation would or would not be used according to a random card selection determined by the circulating nurse. The results confirmed our expectation, and here I will indulge the president's prerogative to bypass the Program Committee and show them to you.

Five hundred and ninety-three patients were randomly assigned into two groups. Group 1 received standard skin preparation in the operating room with chlorhexidine. In group 2 this preparation was omitted. Patients receiving prophylactic or therapeutic antibiotics and those with disease predisposing to infections were excluded. Follow-up was complete. The principal operative procedures as you might expect were cholecystectomy (180 patients) and inguinal herniorrhaphy (184 patients). Overall infection rates were: 0.7% in group 1 (2 of 295 patients) and 1.0% in group 2 (3 of 298 patients). Both rates would normally be considered acceptable for clean, elective surgery, and the results suggest that omission of routine skin "degerming" does not predispose to infection. Obviously, the numbers are small, and a much bigger study would be needed to make them meaningful. I show them to you not for their scientific values so much as to illustrate how questions can be posed and answers sought outside the larger teaching hospital.

Table II. Representative Operating Times

Procedure	Mean time (range), min
Open cholecystectomy with cholangiography	36 (29 – 50)
Anterior resection for carcinoma	79 (63 – 95)

When I made the transition from big city to little city, I thought, or perhaps hoped, that it would be necessary from time to time to refer the more difficult patients to the tertiary care centre. In reality, this happens very infrequently and then only for very specialized care; typical examples are major burns, patients in need of transplants, sick neonates and so on. With the odd exception, patients will do almost anything to avoid a move from their home community. I would like to quote one other example. I am constantly surprised how many women will choose to have a breast removed rather than face 4 weeks of radiotherapy in a city that is only a 4-hour drive away.

Before concluding this description of small-city hospital life, I would like to bring to your attention the very real value of having family practitioners in the hospital. Their knowledge of the patient's home situation, previous illnesses, medications taken and work-related stresses can be of immense value in understanding the patient's reaction to an illness. In addition, family practitioners virtually take over the care of the terminally ill and look after most of the communication with patients' families.

Because I am not burdened with teaching and research commitments, I have time to pursue activities outside medicine. My wife and I run a small business, which has the advantages of providing a common interest and, particularly for me, contact with healthy people who are not meeting me with fear in their hearts. This business will also, I hope, provide the pension I do not otherwise have!

I have not dwelt upon the disadvantages of small city practice because they really are few. A more conscious effort is needed to stay up to date. In the teaching hospital, colleagues and housestaff constantly report and analyse new ideas and techniques. In the nonacademic world, it is sometimes more difficult to maintain perspective, particularly when the information is provided by a commercial source. But by attending meetings such as this it is usually possible to obtain the unbiased information we need both to stay competent and to avoid huge expenditures on equipment that may only represent a passing fad.

So that is what I do. Historians are always interested in exactly what people did as opposed to what they said they did. So they may be interested to know that for doing what I did, I earned a gross income of $209 000 which after overhead and taxes translated into $102 000 take-home pay. I will not comment further on the remuneration except to say that I live well, and this income only looks paltry in light of the truly extraordinary incomes achieved by colleagues in other specialties.

Future Considerations

Obviously what I have described to you is not the life and times of a small-town/rural surgeon, but I believe it is more representative of the typical general surgeon of today and tomorrow. I do not believe the isolated small-town surgeon can continue to exist. We are not training surgeons for that type of practice, nor do I believe the new generation of surgeons will seek that kind of life. I also do not believe that governments will fund the technology that will increasingly be needed; such expensive equipment will only be provided in regional centres where several surgeons including those of other disciplines can put it to full use — in today's terms, make it cost effective.

And let us make no mistake about the future. The field of laparoscopic surgery is exploding, and those who do not take time to master its intricacies are doomed to see their practices wither away as the consumer demands referral to a surgeon skilled in its techniques.

This need for regionalization, I know, begs the question of who will look after the acutely ill or traumatized patient when the roads are blocked by snow and planes can't fly. I suspect this is a relatively rare occurrence, and those who choose to live in remote areas may have to consider such an event in making the decision, much as they might accept a possibly lower standard of education for their children.

In conclusion, may I thank you for the privilege of addressing you about the profile of an urban surgeon in the 1990s.

Reference

1. BARER M, STODDART G: *Toward Integrated Medical Resource Policies for Canada: Background Document*, Manitoba Health, Winnipeg, 1991

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Canadian Laparoscopic Surgery Survey

Marvin J. Wexler, MD, FACS, FRCSC; E. John Hinchey, MD, FACS, FRCSC; John Sampalis, PhD; Jeffrey Barkun, MD, FRCSC

Objective: To assess the status of laparoscopic general surgery in Canada and the training experience and educational needs of Canadian surgeons, particularly with laparoscopic cholecystectomy (LC).

Design: All of Canada's practising general surgeons were surveyed by mail approximately 15 months after the general availability of laparoscopic video equipment. Questionnaires completed by 736 surgeons form the basis of the analysis.

Setting: The respondent profile produced a good sample distribution to assess differences related to age, experience, location and type of practice; 30% practised in communities of 50 000 or less; 38% in hospitals with 250 or fewer beds and 57% in community hospitals.

Results: Eighty-four percent had already learned LC, and 51% of them had performed more than 25 LCs. The number performed correlated directly with the number of cholecystectomies usually performed yearly before laparoscopy. Age and lack of relevance to practice were reasons for not learning. Ninety-one percent took formal training courses, usually university sponsored and in Canada. Complications were experienced by 44% of respondents. Bile leak (26%), hemorrhage (15%) and bile-duct injury (9%) were the most common and increased as the number of cholecystectomies usually performed prior to LC increased. Age, sex, type and location of hospital and size of city were not significant factors. The data show a consistent ($p < 0.001$) increase in the proportion of surgeons who encountered a complication as the number of LCs performed increased.

Conclusions: LC has been introduced in Canada in an unpredicted, rapid and seemingly orderly and responsible fashion in all areas, types and sizes of communities. It has been equally well applied by surgeons of all ages and size of practice whether practising in the smaller community or in the university centre. The dogma of complications releated to a "learning curve" is not supported by the author's data, and experience with complications is not restricted to the occasional biliary surgeon. Continued vigilance is necessary.

Objectif : Évaluer la situation de la chirurgie générale par laparoscopie au Canada et l'expérience de la formation et les besoins en éducation des chirurgiens canadiens, particulièrement en ce qui concerne la cholécystectomie laparoscopique (CL).

Conception : Un sondage postal a été mené auprès de tous les chirurgiens généraux qui pratiquent au Canada environ 15 mois après que des appareils vidéo de laparoscopie soient généralement devenus accessibles. L'analyse est fondée sur les questionnaires remplis par 736 chirurgiens.

Contexte : Le profil des répondants a produit une bonne distribution dans l'échantillon pour évaluer les différences liées à l'âge, l'expérience, le lieu et le type de pratique; 30 % des chirurgiens pratiquaient dans des collectivités de 50 000 habitants ou moins; 38 % dans des hôpitaux de 250 lits ou moins et 57 % dans des hôpitaux communautaires.

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Supported by grants from the Canadian Association of General Surgeons and the Fast Foundation

Accepted for publication Apr. 7, 1993

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← For prescribing information see page 276

Résultats : Quatre-vingt-quatre pourcent des répondants avaient déjà appris la CL, et 51 % d'entre eux avaient effectué plus de 25 CL. Le nombre d'interventions pratiquées est en corrélation directe avec le nombre annuel de cholécystectomies habituellement pratiquées avant l'accessibilité à la laparoscopie. L'âge et le manque de pertinence à la pratique étaient les raisons pour ne pas apprendre cette technique. Quatre-vingt-onze pourcent des chirurgiens ont suivi des cours de formation officiels, habituellement parrainés par des universités au Canada. Quarante-quatre pourcent des répondants avaient une expérience de complications. Les fuites de bile (26 %), les hémorragies (15 %) et les lésions des canaux biliaires (9 %) étaient les complications les plus fréquentes, et elles ont augmenté à mesure que s'accroissait le nombre de cholécystectomies normalement pratiquées avant l'accessibilité à la CL. L'âge et le sexe du praticien, le type et la situation de l'hôpital et l'importance de la ville n'étaient pas des facteurs significatifs. Les données témoignent d'une augmentation constante ($p < 0{,}001$) de la proportion des chirurgiens qui ont fait face à une complication à mesure que s'accroissait le nombre de CL pratiquées.

Conclusions : La LC a été adoptée au Canada d'une manière soudaine, rapide et apparemment ordonnée et responsable quels que soient la région, le type et l'importance des collectivités. Sa mise en oeuvre par les chirurgiens a été tout aussi appropriée quels que soient leur âge et l'importance de leur clientèle, dans de petites collectivités ou dans des centres universitaires. Le dogme selon lequel les complications sont liées à une «courbe d'apprentissage» n'est pas corroboré par les données de l'auteur, et l'expérience des complications ne se limite pas à une occasionnelle chirurgie des canaux biliaires. Une vigilance soutenue est de mise.

It is probable that no new procedure in surgery has been introduced more rapidly or has captured the interest of the profession and patient population alike than laparoscopic cholecystectomy. A recent study by the Institute for Scientific Information, in which a complex co-citation analysis method of the 1991 scientific literature was used,[1] ranked laparoscopic cholecystectomy as the most active field in all of science for that year, outranking such areas as the effect of serotonin on blood vessels and the origin of human immunodeficiency virus isolates!

General surgeons came under intense pressure from the public to offer them this new technology. This vigorous consumer demand was exacerbated by the medical industry and fueled by expectations of minimal patient discomfort postoperatively, shorter hospital stay and the patient's almost immediate return to normal activity. There have been a number of reports of complications, particularly bile-duct injury, and resulting law suits, which have led to criticism over the speed with which this laparoscopic technique was introduced.

There is considerable interest in how such a new, highly technical procedure can be learned and introduced safely into surgical practice. The purpose of this survey is to assess the status of laparoscopic general surgery in Canada and the training experience and educational needs of Canadian surgeons, particularly with respect to laparoscopic cholecystectomy.

Material and Methods

In April and May 1992, approximately 15 months after video laparoscopic equipment became generally available in Canada, we mailed 1400 questionnaires to all practising Canadian general surgeons, who were identified from the updated Southam database. The questionnaire was designed to obtain a description of the respondents' profiles with respect to the following demographic data: location of practice and hospital affiliation; training with respect to laparoscopic cholecystectomy; and experience with this procedure, including complications.

Within 6 months of the original mailing, 736 completed questionnaires were returned. They form the basis of this initial analysis.

Descriptive statistics were used to describe the results of the survey. Proportions were calculated with the number of respondents as the denominator; when appropriate the denominator used was the number of respondents in specific categories. Differences with respect to the distributions of response choices between groups of respondents were calculated using the χ^2 statistic. Differences were considered statistically significant at a probability of 0.05.

The unit of analysis in the reported results was the respondent. Therefore, all results pertaining to the complications experienced are presented with the responding surgeon as the unit of analysis. In interpreting these data, the propor-

tions reported should not be considered as rates of complications because this implies a proportion where the procedure or patient is the unit of analysis. The data obtained in this survey do not provide us with the information required to compute these rates. Instead, the proportions reported represent the number of respondents that have experienced the specific complication in their practice at least once.

Results

Demographic Profile

Table I shows the demographic profile of the 736 respondents. There was an almost equal distribution among the three age groups with a smaller number (17%) of the respondents being over 60 years of age. Only 5% of the responding surgeons were women. Three hundred and fifteen (44%) were located in a city with a population over 250 000; however, almost one-third (30%) were practising in communities with populations of 50 000 or less. Although 62% practised in a hospital with 251 beds or more, over one-third (38%) were in medium or small hospitals with 250 beds or fewer. The majority of the respondents (57%) were practising in a community hospital.

Forty-eight percent of the respondents normally performed more than 50 cholecystectomies annually, using all approaches; only 19% routinely performed less than 26.

Table I also shows the profile of the respondents according to whether they had learned laparoscopic cholecystectomy (LC) at the time of the survey. A significantly ($p < 0.0001$) lower proportion of surgeons over the age of 60 years (65%) had learned this procedure compared with the proportions of surgeons from the other age categories (90%). There were no sex differences. A significantly ($p = 0.01$) lower proportion of surgeons practising in cities of over 250 000 people reported learning LC (81%) compared with approximately 90% of surgeons who were practising in smaller communities. Similarly, general surgeons practising in large hospitals (more than 500 beds) had the lowest proportion learning LC followed by surgeons practising in very small hospitals (100 beds or fewer) ($p < 0.0001$). Surgeons in primary university hospitals showed the lowest percentage having learned LC (77%) compared with those practising in university-affiliated hospitals (87%) and those practising in community hospitals (89%) ($p = 0.002$).

There was a direct association

Table I. Profile of Respondents and Distribution According to Whether They Learned Laparoscopic Cholecystectomy (LC) ($N = 736$)

		Number (%)			
			Learned LC		
Demographic features	**Category**	**Total***	**Yes**	**No**	***p* value†**
Age, yr	30 – 40	189 (26)	169 (90)	19 (10)	≤ 0.0001
	41 – 50	219 (30)	201 (92)	18 (8)	
	51 – 60	193 (27)	169 (89)	21 (11)	
	> 60	121 (17)	75 (65)	40 (35)	
Sex	Male	666 (95)	569 (86)	89 (14)	0.77
	Female	34 (5)	30 (88)	4 (12)	
City size (per thousand population)	≤ 10	41 (6)	36 (88)	5 (12)	0.01
	11 – 30	99 (14)	88 (89)	11 (11)	
	31 – 50	72 (10)	67 (93)	5 (7)	
	51 – 250	190 (26)	170 (90)	18 (10)	
	> 250	315 (44)	250 (81)	58 (19)	
Hospital size (no. of beds)	≤ 100	79 (11)	63 (81)	15 (19)	≤ 0.0001
	101 – 250	194 (27)	179 (94)	12 (6)	
	251 – 500	251 (36)	218 (88)	31 (12)	
	> 500	184 (26)	143 (79)	38 (21)	
Hospital type	Primary university	128 (18)	96 (77)	29 (23)	0.002
	University affiliated	183 (25)	155 (87)	24 (13)	
	Community	407 (57)	361 (89)	44 (11)	
Cholecystectomy, no./yr prior to LC	≤ 15	63 (9)	22 (37)	37 (62)	≤ 0.0001
	16 – 25	73 (10)	58 (81)	14 (19)	
	26 – 50	230 (33)	207 (90)	22 (10)	
	> 50	333 (48)	322 (97)	9 (3)	

*Columns do not equal row totals because some items were not answered by all respondents.
†The respondent groups for which *p* values were calculated are outlined in the text.

between the number of cholecystectomies usually performed annually before laparoscopy and the proportion of respondents who reported having learned laparoscopic surgery. Only 37% of surgeons who performed 15 or fewer cholecystectomies per year learned the laparoscopic approach, and this proportion increased to 97% as the number of cholecystectomies increased to over 50 per year ($p < 0.0001$).

Training Experience

Table II describes the laparoscopic training experience of the 736 respondents. At the time of survey, 620 (84%) had already learned LC. Of these, 90% had already started performing the procedure in patients. The majority (61%) had begun with a more experienced surgeon; approximately half started with a partner of similar experience, whereas under 10% began alone. With respect to assistance during LC, another surgeon was present most frequently (69%), followed by a non-surgeon physician (39%) or a resident (35%). Nurses or physician-assistants were infrequently employed (in less than 12% of cases).

Lack of equipment was the most commonly quoted reason for having been trained but not starting laparoscopic surgery among the 64 (10%) respondents in that category.

Of the responding surgeons, 116 (16%) had not taken formal laparoscopic training. Among these, two-thirds had no intention of learning, generally because the procedure was irrelevent to their practice (37%) or because of age and approaching retirement (33%).

Of the respondents who had learned laparoscopic surgery, 91% had taken a formal course (Table III). The majority (79%) had taken a university-sponsored course. Industry or non-university-sponsored courses were taken by 15% and 4% of respondents respectively. The majority (88%) had taken their course in Canada. Most were exposed to didactic lectures, hands-on experience with animals and videotapes. Only 44% of trainees had direct hands-on experience in humans as part of their course. Although 461 (74%) of the 620 respondents who received formal training felt the course allowed them the expertise or confidence to commence laparoscopic surgery in humans, the majority sought additional "training" by visiting an experienced surgeon (clinical preceptor) (55%), observing videotapes (57%) and proctorship in their own hospital with a laparoscopic surgeon (48%). Additional courses, experience with animals, training boxes and sponsored symposia by major organizations were infrequent sources of additional training and were considered to be of least value. Similarly, reading the literature, although fequently performed, was thought to be of lesser value.

Table II. Training for LC in Responding Surgeons ($N = 736$)

Parameter	No. (%)*
Learned LC	620 (84)
Have started performing LC	556 (90)
Alone	52 (9)
Similar experienced partner	269 (48)
More experienced proctor	339 (61)
Assistant in LCs	
Another surgeon	382 (69)
Non-surgeon physician	218 (39)
Resident	195 (35)
Physician assistant	55 (10)
Nurse	66 (12)
Not yet started LC because of	64 (10)
Lack of equipment	28 (44)
Lack of privileges	6 (9)
Lack of confidence	2 (3)
Lack of patients	3 (5)
Lack of interest	3 (5)
No relevance to practice	7 (11)
Time consuming	2 (3)
Other	20 (31)
Have not learned LC	116 (16)
Plan to learn LC	40 (34)
Do not plan to learn LC because of	76 (66)
Lack of equipment	4 (5)
Lack of privileges	1 (1)
Lack of confidence	2 (3)
Lack of patients	3 (4)
Lack of interest	7 (9)
No relevance to practice	28 (37)
Time consuming	3 (4)
Other (age, retirement, etc)	25 (33)

Laparoscopic Practice Profile

Of the 556 respondents who had started performing LC, 286 (51%) had already performed more than 25 operations; 158 (28%) had performed more than 50 operations (Table IV). Only 107 (19%) had performed 10 or fewer LCs. The number of procedures attempted is outlined according to the surgeon's demographic profile. Surgeons in larger cities and larger hospitals

Table III. Methods of Learning Laparoscopic Surgery in Respondents Who Received Formal Training ($n = 620$)

Parameter	No. (%)
Had taken a course	564 (91)
Type of course	
University sponsored	445 (79)
Industry sponsored	82 (15)
Non-university hospital	22 (4)
Location	
Canada	496 (88)
United States	61 (11)
Europe	5 (1)
Components	
Didactic lectures	545 (97)
Animals (hands on)	542 (96)
Videotapes	514 (91)
Humans (hands on)	248 (44)
Humans (observation only)	196 (35)
Additional training	
Videotapes	323 (57)
Literature review	316 (56)
Visited experienced surgeon	309 (55)
Proctorship in own hospital	268 (48)
Training box	113 (20)
Additional animal labs	90 (16)
Second course	79 (14)
Symposia	77 (14)
Other	45 (8)
Residency	17 (3)

were more likely to have performed more than 50 LCs. Surgeons in primary university or university-affiliated hospitals were also more likely to have performed at least 50 LCs. The number of LCs performed directly correlated with the number of cholecystectomies usually performed every year before the introduction of LC. All of these associations are statistically significant ($p < 0.003$).

Experience and Complications

The majority (71%) of surgeons used a closed (Veress) needle technique for pneumoperitoneal access. An open (Hasson) method was used by only 40%. The majority of surgeons selectively used intraoperative cystic duct cholangiography during LC, 3% used it routinely and 33% never used it (Table V).

A substantial number of surgeons had experienced complications. Of the 556 respondents who performed LC, 142 (26%) reported at least one bile leak and 84 (15%) reported hemorrhage as a major complication. Bile-duct injury was reported by 50 (9%) respondents, peritonitis by 20 (4%) and bowel injury by 21 (4%), vascular injury by 10 (2%) and death related to LC by 3 (1%). No correlation was found between failure to perform operative cholangiography and the development of biliary complications.

The possible association between respondent profile and the proportion of respondents who said they experienced one of the seven complications listed was examined. These data showed that the proportion having a complication was not different when age, sex, size of practice and type of hospital or size of city in which they practised were considered. Although there was a trend of respondents from larger cities having a higher proportion

Table V. Experience Among Respondents Who Performed LC ($n = 556$)

Parameter	No. (%)
Technique of pneumoperitoneal access	
Closed (Veress needle)	392 (71)
Open (Hasson method)	222 (40)
Disposable trochars	105 (19)
Nondisposable trochars	129 (23)
Disposable and nondisposable trochars	153 (28)
Cholangiography	
Never	186 (33)
Selective	357 (64)
Always	13 (2)
Complications	
Bile-duct leak	142 (26)
Hemorrhage	84 (15)
Bile-duct injury	50 (9)
Bowel injury	21 (4)
Vascular injury	10 (2)
Peritonitis	20 (4)
Death	3 (1)

Table IV. Profile of 556 Respondents Who Performed LC According to the Number Attempted*

Demographic features	Category	LCs attempted, no. (%) ≤ 10	11 – 25	26 – 50	> 50	p value†
No. of respondents		107 (19)	161 (29)	128 (23)	158 (28)	
Age, yr	30 – 40	27 (18)	39 (25)	37 (24)	51 (33)	0.53
	41 – 50	32 (18)	48 (27)	41 (23)	55 (31)	
	51 – 60	31 (20)	47 (31)	35 (23)	38 (25)	
	> 60	14 (20)	26 (38)	15 (22)	13 (19)	
Sex	Male	98 (19)	148 (29)	124 (24)	142 (28)	0.24
	Female	6 (25)	10 (42)	2 (8)	6 (25)	
City size (per thousand population)	≤ 10	8 (40)	6 (30)	3 (15)	3 (15)	≤ 0.0001
	11 – 30	19 (25)	32 (42)	14 (18)	11 (14)	
	31 – 50	18 (30)	19 (32)	11 (18)	12 (20)	
	51 – 250	29 (18)	49 (31)	38 (24)	44 (28)	
	> 250	32 (14)	50 (22)	56 (25)	88 (39)	
Hospital size (no. of beds)	≤ 100	12 (24)	20 (40)	9 (18)	9 (18)	0.0001
	101 – 250	40 (25)	54 (34)	35 (22)	29 (18)	
	251 – 500	34 (17)	55 (27)	47 (23)	68 (33)	
	> 500	17 (13)	29 (23)	31 (24)	50 (39)	
Hospital type	Primary university	16 (20)	17 (21)	19 (23)	29 (36)	0.003
	University affiliated	17 (12)	38 (26)	37 (25)	55 (37)	
	Community	71 (22)	105 (33)	70 (22)	73 (23)	
Cholecystectomy, no./yr prior to LC	≤ 15	10 (77)	2 (15)	1 (8)	0 (0)	≤ 0.0001
	16 – 25	27 (51)	23 (43)	3 (6)	0 (0)	
	26 – 50	41 (23)	77 (44)	45 (25)	14 (8)	
	> 50	28 (9)	57 (18)	78 (25)	144 (47)	

*Numbers do not always total correctly because some items were not answered by all respondents.
†The respondent groups for which the p values were calculated are outlined in the text.

reporting a complication, the numbers were not statistically significant.

The number of respondents reporting a bile-duct leak, bile-duct injury, vascular injury or hemorrhage during laparoscopic surgery increased as the number of cholecystectomies usually performed per year, prior to laparoscopy, increased (Table VI). With respect to bile-duct leak, 33% of the surgeons who performed more than 50 cholecystectomies annually by all approaches reported experience of this complication with the laparoscopic method compared with 20% to 23% for those who performed 16 to 50 LCs annually and only 9% for those who performed 15 or fewer LCs annually ($p = 0.018$). Similarly, with bile-duct injuries, 15% of the respondents who usually performed more than 50 LCs a year had experience with this complication laparoscopically compared with 2% to 4% for those performing between 16 and 50 LCs annually ($p = 0.001$). Only surgeons who performed more than 50 cholecystectomies a year had experience with vascular injury (10 surgeons [4%]) ($p = 0.04$).

Table VI also shows the proportion of respondents who reported complications, according to the method of initiating LC, the type of assistant used and the number of LCs attempted. These data indicate that a relatively higher but not statistically significant proportion of surgeons who began LC alone or with a similarly experienced surgeon reported bile-duct leak or injury compared with those who began this procedure with a more experienced proctor. The surgical experience of a first assistant did not help to avoid complications. The data do show a consistent and statistically significant ($p = 0.0001$) increase in the proportion of respondents who encountered bile-duct leak, bile-duct injury, hemorrhage or peritonitis as the number of LCs performed increased.

The proportion of respondents reporting laparoscopic complications was compared with the characteristics of the training course taken. No association was found between the proportion of surgeons indicating complications and the components of the laparoscopic course taken. This finding was similar whether the course was taken in the United States or Canada. A higher proportion of respondents who took a course at a non-university hospital reported bile-duct leaks (45%) compared with a university- or industry-sponsored

Table VI. Complications Reported Versus Method of Initiation, Assistant and Experience With LC and Cholecystectomy Prior to LC*

	Complication, no. (%)						
Parameter	**Bile-duct leak**	**Bile-duct injury**	**Bowel injury**	**Vascular injury**	**Hemorrhage**	**Peritonitis**	**Death**
Cholecystectomy, no./yr prior to LC							
≤ 15	1 (9)	0 (0)	1 (8)	0 (0)	2 (17)	0 (0)	0 (0)
16 – 25	10 (20)	2 (4)	0 (0)	0 (0)	2 (4)	0 (0)	0 (0)
26 – 50	37 (23)	4 (2)	5 (3)	0 (0)	22 (13)	4 (3)	1 (1)
> 50	94 (33)	43 (15)	15 (5)	10 (4)	58 (21)	16 (6)	2 (1)
p value†	(0.018)	(≤0.001)		(0.04)	(0.015)		
Initiation							
Alone	14 (30)	8 (17)	2 (4)	2 (4)	8 (17)	2 (4)	0 (0)
Similarly experienced colleague	76 (31)	25 (11)	14 (6)	5 (2)	53 (22)	12 (5)	2 (1)
More experienced proctor	72 (24)	23 (8)	7 (2)	6 (2)	42 (14)	8 (3)	1 (0.3)
Assistant							
Another surgeon	85 (25)	25 (7)	15 (4)	6 (2)	51 (15)	13 (4)	1 (0.3)
Non-surgeon physician	64 (32)	20 (10)	9 (5)	3 (2)	39 (20)	5 (3)	0 (0)
Resident	55 (32)	24 (14)	8 (5)	5 (3)	23 (14)	11 (7)	3 (1.8)
Nurse	18 (29)	4 (6)	2 (3)	1 (2)	13 (21)	1 (2)	0 (0)
Physician assistant	14 (32)	8 (17)	1 (2)	4 (9)	14 (30)	3 (7)	0 (0)
LCs attempted, no.							
≤ 10	9 (9)	0 (0)	2 (2)	0 (0)	6 (6)	0 (0)	0 (0)
11 – 25	28 (19)	5 (4)	4 (3)	1 (1)	15 (10)	0 (0)	0 (0)
26 – 50	35 (31)	16 (14)	6 (5)	5 (5)	21 (18)	6 (6)	0 (0)
> 50	70 (47)	29 (20)	9 (6)	4 (3)	42 (10)	14 (10)	3 (2)
p value†	(0.0001)	(0.0001)		(0.06)	(0.0001)	(0.0001)	(0.06)

*Numbers do not always total correctly because some items were not answered by all respondents.
†The respondent groups for which significant *p* values were obtained are indicated – see text.

course (27%). This was also true for peritonitis (16% versus 3% to 4%).

Of the 556 surgeons who had performed LC, 245 (44%) had experience with one or more of the complications (Table VII). Of these, 176 (32%) had experience with only one type of complication, 46 (8%) had experience with two different complications and 19 (3%) had experience with three types of complication. There was no significant clustering of types of complications reported by individual surgeons. Experience with any one complication did not increase the likelihood of having experience with any other type of adverse event.

Discussion

Within 15 months of the ready availability of video laparoscopic equipment in Canada, 85% of general surgeons responding to our questionnaire had already learned and most were already performing LC. More than 50% of those performing the procedure had performed over 25 procedures, most being assisted by another general surgeon. The majority of those who had not yet learned LC had no intention of doing so, usually for reasons of age or lack of relevance to their practice. The reasons for the significantly smaller proportion of those in large cities or hospitals and university-based surgeons having failed to learn the technique is probably related to the more specialized interests or practice of surgeons in this environment. This reasoning is supported by the significant correlation between having learned LC and the number of cholecystectomies usually performed each year prior to LC.

The entire community of Canadian general surgeons in both urban and rural practice, like their American counterparts, were quick to see the potential of the new minimal access surgery and to acquire the skills necessary for its performance. Our respondent profile is skewed toward the younger surgeon but with a relatively good sample distribution to assess differences possibly related to size of hospital, size of community and type of practice (whether academic or community oriented). Thirty percent of respondents practised in smaller communities of 50 000 or less, 38% in hospitals with 250 or fewer beds and 57% in a community hospital without university affiliation. The data show that 91% of surgeons took a formal training course, usually university sponsored and in Canada. This often did not include hands-on human experience. Despite feeling confident to begin human or clinical application, most surgeons followed the training with additional operative experience with proctors in their own or other institutions.

The rate of the major complications associated with this procedure from the patient's standpoint is impossible to determine from this survey. However, complications have been experienced by a number of surgeons. Forty-four percent reported one or more complications. Bile-duct leakage, hemorrhage and bile-duct injury were the most common. Surgeons who initially learned laparoscopic surgery with a more experienced proctor were less likely to report experience with complications later in their practice.

The data suggest that experience with complications is not restricted to the occasional biliary surgeon but rather the surgeon who traditionally performed the largest number of cholecystectomies per year. Moreover, the data do not support the concept that most complications occur during the supposed inexperienced phase. Rather, there is a continuing relationship between the number of LCs attempted and the proportion of surgeons experiencing a complication. None of the 107 surgeons (19% of respondents) who had attempted 10 or fewer LCs reported experience with a bile-duct injury. Only 5 of the 161 surgeons who performed 11 to 25 LCs (29% of respondents) had experience with a duct injury whereas 16 of the 128 surgeons (23% of respondents) who attempted 26 to 50 LCs and 29 of 158 (28% of respondents) who did more than 50 LCs had experience of a duct injury. Our data do not allow us to know at what point in each surgeon's experience the complication occurred. Despite this,

Table VII. Distribution of Complications Reported

Complications, no.	Respondents, no. (%)	Complication, no.						
		Bile-duct leak	Bile-duct injury	Bowel injury	Vascular injury	Hemorrhage	Peritonitis	Death
1	176 (32)	90	25	9	5	44	3	0
2	46 (8)	36	12	5	2	27	8	2
3	19 (3)	17	10	7	2	15	6	0
4	3 (0.5)	3	3	0	0	2	3	1
5	1 (0.2)	1	1	0	1	1	1	0
Total	245 (44)	147	51	21	10	89	21	3

*Percent of total no. of respondents who performed LC (556)

given the equal distribution of LCs attempted across groups and the stable technology over the short survey period, we may assume that the correlation found indicates that the popular notion of bile-duct injury being due to a surgeon's "learning curve" is incorrect. With more experience the surgeon may attempt more difficult cases and be less disposed to convert to open surgery in the face of a technical challenge. Also, bile-duct injury is not a phenomenon of the surgeon practising in a smaller hospital or a community with a lesser or inadequate volume of cases. Indeed, whereas proportionately more LCs were done in larger cities, larger hospitals and university or university-affiliated centres, the proportion of surgeons from these areas reporting complications was similar to the proportion from the smaller, peripheral or rural hospitals. The view that this high-technology surgery practised in smaller communities results in a less successful outcome is not supported by our findings.

Conclusions

LC has been introduced into the repertoire of the Canadian general surgeon in an unprecedented, rapid, yet seemingly orderly and responsible manner in all areas, types and sizes of communities. Although the number of surgeons reporting a complication appears surprisingly large, the data are reported from the surgeon's rather than the patient's perspective. With the exception of bile-duct or vascular injury, most complications have proved to be of minor consequence to the patient. They are not the result of too rapid a transition from animal to human in an irresponsible manner as suggested by some lay critics.

This technique has been equally well applied by the surgeon in the smaller community as it has in the tertiary care centre. Although older surgeons and those with subspecialty interests have been reluctant and to embrace this new technology, it is clear that LC has been undertaken by surgeons of all ages and levels of experience with equal success. The oft-perpetuated dogma of complications being related to the "learning curve" is not supported by our data. It is anticipated that further improvements in visual technology and instrumentation will decrease the number of complications. However, national, educational and training guidelines are essential. Continued vigilance is necessary as the indications and applications of this new approach are extended.

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SESAP VII Question / Question SESAP VII

Item 169

Which of the following statements about pseudomembranous colitis is TRUE?

(A) The carrier rate for *Clostridium difficile* is 30% in healthy adults

(B) The disease can be caused by *C. difficile* in patients without antibiotic exposure

(C) Stool cultures are the preferred method of establishing a diagnosis

(D) The disease commonly can be caused by organisms other than *C. difficile*

(E) The disease is best treated with intravenous antibiotics

For the five answers given above select the one that is best.

For the critique of Item 169 see page 250.

Intravenous Regional Anesthesia in the Treatment of Forearm and Wrist Fractures and Dislocations in Children

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Objective: To evaluate the efficacy and safety of intravenous regional anesthesia in the treatment of unilateral closed fractures and dislocations of forearm or wrist in children.
Design: A prospective study over 6 years.
Setting: The study was undertaken in the well-equipped emergency department of a community general hospital for ambulatory patients.
Patients: One hundred and thirty-nine children between the ages of 4 and 18 years with unilateral closed fractures and dislocations of forearm or wrist.
Intervention: All children received premedication with a combination of meperidine and promethazine (0.5 mg/kg intramuscularly) and regional upper limb anesthesia with 0.5% lidocaine solution (3 mg/kg intravenously) after inflation of an arm tourniquet.
Main Outcome Measures: The relief of pain, allowing closed reduction with intravenous regional anesthesia, and the incidence of complications.
Results: All patients had complete relief of pain allowing successful closed reduction in 133 patients (96%); tourniquet pain occurred in 10 patients (7%). There were no symptoms of lidocaine toxicity. There were no neurovascular or compartment syndrome complications.
Conclusions: Intravenous regional anesthesia for the treatment of fractures and dislocations of forearm and wrist in children was found to be simple, safe and effective.

Objectif : Evaluer l'efficacité et l'innocuité de l'anesthésie régionale par voie intraveineuse, dans le traitement des fractures unilatérales fermées et des luxations au niveau du coude ou du poignet, chez l'enfant.
Conception : Une étude prospective d'une durée de 6 ans.
Contexte : L'étude a été menée dans un sevice d'urgence bien aménagé d'un hôpital général communautaire pour patient ambulatoire.
Patients : Cent trente-neuf enfants âgés de 4 à 18 ans souffrant de fractures unilatérales fermées et de luxation du coude, de l'avant-bras et du poignet.
Intervention : Tous les enfants ont reçu une prémédication constituée d'une association de mépéridine et de prométhazine (0,5 mg/kg par voie intramusculaire) et une anesthésie régionale du membre supérieur à l'aide d'une solution de lidocaïne à 0,5 % (3 mg/kg par voie intraveineuse) après gonflement d'un garrot autour du bras.
Mesure des principaux résultats : Le soulagement de la douleur permettant une

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Accepted for publication Nov. 19, 1992

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réduction fermée sous anesthésie régionale intraveineuse, et la fréquence des complications.
Résultats : Tous les patients ont eu un soulagement complet de la douleur permettant de réussir une réduction fermée chez 133 patients (96 %); une douleur due au garrot est survenue chez 10 patients (7 %). Aucun signe de toxicité à la lidocaïne n'a été observé. Il n'y a eu aucune complication neurovasculaire ou syndrome des loges.
Conclusions : L'anesthésie régionale intraveineuse pour le traitement des fractures et dislocations du coude, de l'avant-bras et du poignet chez l'enfant s'est avérée simple, sûre et efficace.

Currently, general anesthesia and hematoma block are the most common means of achieving anesthesia in the treatment of childhood upper limb injuries. Hematoma block is painful, and often relief is incomplete. When general anesthesia is chosen primarily or in cases of hematoma block failure, admission to hospital is necessary, substantially increasing the cost of care and risk to the patient. In addition, treatment is often delayed because of the relatively low operative priority of these injuries or because the child has recently been fed.

Intravenous regional anesthesia in children has yet to gain wide support despite reports, though few in number, demonstrating its safe and effective application.[1-5] Objections to the use of intravenous regional anesthesia in children stem from concerns about patient cooperation, toxicity of lidocaine and failure of equipment or technique.

A prospective study was undertaken to evaluate the efficacy and safety of intravenous regional anesthesia in the treatment of childhood forearm and wrist injuries.

Patients and Methods

During the 6 years 1985 to 1991, all children who presented with upper limb fractures and dislocations at or distal to the elbow and were treated by the senior author only were included in the study. Children with bilateral or open injuries were excluded. The study protocol was in accordance with approved institutional guidelines.

Technique

The children's parents were encouraged to remain at the bedside to provide support and facilitate patient compliance. All children received a combination of meperidine and promethazine, 0.5 mg/kg intramuscularly, as premedication. A single sphygmomanometer cuff, with continuous pressure monitoring, was applied to the upper arm and attached to a simple hand-held pump to lessen the risk of tourniquet failure during transport to and from the radiology department (Fig. 1). A butterfly needle of appropriate size was inserted into a dorsal hand vein of the injured limb and the tourniquet inflated to 200 to 225 mm Hg. A solution of 0.5% lidocaine at a dose of 3 mg/kg was injected intravenously. Closed reduction was undertaken, a below-elbow cast applied and radiography performed. The tourniquet was deflated 30 minutes after the lidocaine injection, and the cast was completed to the above-elbow level if necessary. Patients were discharged from the emergency department usually within 30 minutes after completion of the treatment. They were observed for symptoms of acute lidocaine toxicity: nausea, vomiting, tinnitus, blurred vision, twitching or convulsions. The hand was checked for acute swelling, return of finger motion and capillary circulation before discharge. Parents were given detailed written instructions and urged to bring the child back to the emergency department if excessive swelling developed.

Results

Over the study period 139 children (94 boys, 45 girls) were treated. They ranged in age from 4 to 18 years (mean 10.5 years) (Fig. 2).

The most common injuries (66% of all fractures and dislocations of the forearm and wrist) were combined fractures of the radius and ulna at the level of either the distal diaphysis or metaphysis (Table I). A spectrum of injury severity from angulated to completely displaced fractures was encountered and treated successfully by this technique (Fig. 3).

There were no failures of anesthesia. All patients had complete relief of pain. One tourniquet failure occurred at 15 minutes of tourniquet application, but no deleterious

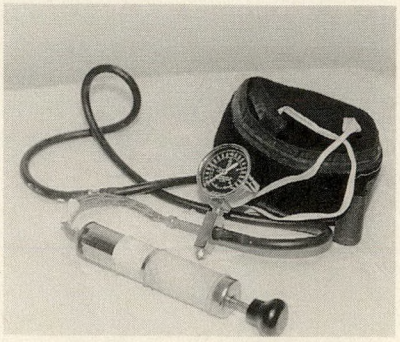

FIG. 1. Single-cuff sphygmomanometer attached to simple hand-held pump served as tourniquet.

anesthetic side effects were noted.

Of the 139 children, 133 (96%) underwent successful reduction of their injuries in the emergency department with this anesthetic technique. All patients were released from hospital after their treatment. No overnight hospitalizations were necessary.

Reduction failed in six patients, all with combined fractures of radius and ulna, necessitating admission to hospital and general anesthesia. Closed reduction was successful in one child, but the remaining five required open reduction and internal fixation. Soft-tissue interposition was found in three of these five patients.

Three patients with distal diaphyseal fractures of both the radius and ulna were found to have loss of reduction at 1 week follow-up. These fractures, once again, were successfully reduced under intravenous regional anesthesia.

There were no significant complications. Ten children (7%) had severe tourniquet pain necessitating release of the tourniquet after 25 minutes. The tourniquet was released after 30 minutes in the remaining patients. There were no symptoms or signs of lidocaine tox-

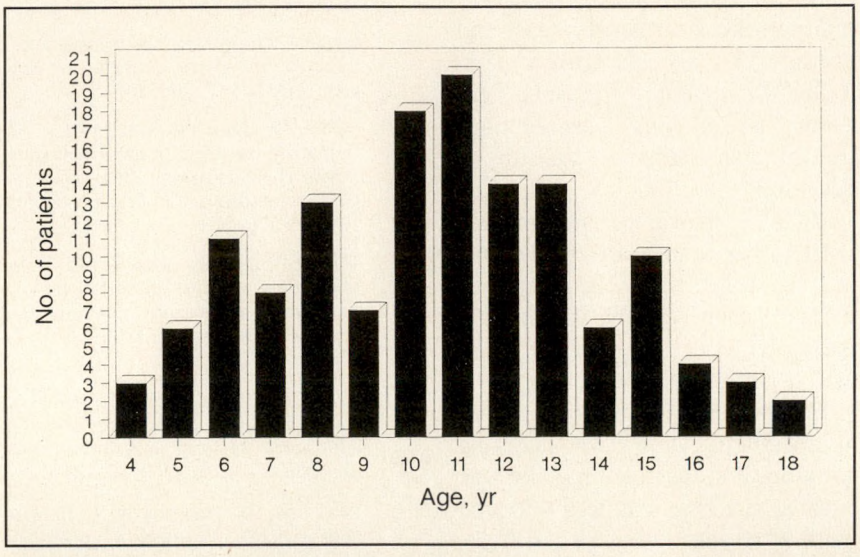

FIG. 2. Age distribution of children treated.

Table I. Types and Frequency of Injuries Treated

Injury type	No. of cases
Distal diaphyses of radius and ulna	60
Distal metaphyses of radius and ulna	32
Distal epiphyses of radius and ulna (Salter I/II)	24
Mid-diaphyses of radius and ulna	14
Anterior dislocation of radial head	3
Trans-scaphoid, perilunate fracture dislocation	3
Proximal phalanx of index finger	1
Volar dislocation of distal radioulnar joint	1
Posterior dislocation of elbow	1

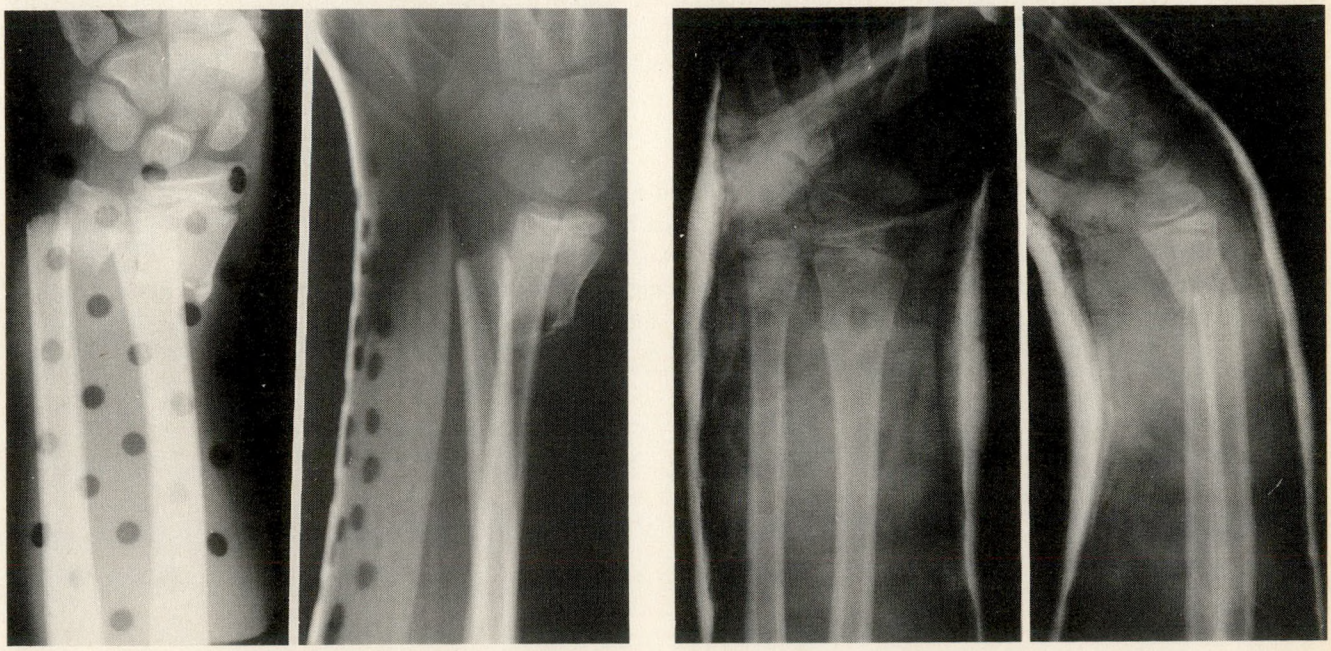

FIG. 3. (Left) Prereduction radiographs of forearm fracture in 8-year old boy. Note complete displacement of fracture fragments. (Right) Same extremity after satisfactory reduction and casting under intravenous regional anesthesia.

icity. Seven patients (5%) had excessive swelling within the the first few days after treatment for which their casts were bivalved. There were no neurovascular or compartment syndrome complications.

Discussion

The results of this study demonstrate that intravenous regional anesthesia is a safe, easily administered, well tolerated and effective method for the treatment of wrist and forearm injuries in children. Patient cooperation is best obtained through reassurance and careful explanation of the technique, sedative premedication and the presence of the parent throughout the treatment.

A single-cuff tourniquet with continuous pressure monitoring, attached to a simple, hand-held pump is simple to use and is well tolerated.[1,2] Double-cuff systems do allow for greater patient comfort, particularly during interventions longer than 45 minutes.[3] Because of the 30-minute tourniquet time in our study, a double cuff was not required.

Lidocaine, when injected into the limb venous system, rapidly enters and diffuses through the extracellular fluid and muscle mass.[6] This occurs in spite of minimal blood flow within the limb. Such pharmacokinetics likely explain the absence of symptoms in our patient in whom the tourniquet failed at 15 minutes and in other similar reported cases.[5,7]

It has been suggested that lidocaine at a dose of 3 mg/kg poses a risk of toxicity in the outpatient setting.[8,9] Our study does not support this finding nor do other studies in which the dose of lidocaine equalled or even exceeded 3 mg/kg.[1,5] When lidocaine is given at this dose, the peak plasma lidocaine concentration is reached 5 minutes after tourniquet release and averages 1.4 μg/mL, with a maximum 2.7 μg/mL.[10] Plasma lidocaine levels must exceed 4.4 μg/mL for signs of toxicity to develop.[10]

A 0.5% lidocaine solution was used rather than a 1.0% solution[11] in the belief that the increased volume improves the anesthesia, particularly in the younger child who requires a smaller dose.

In this study, intravenous regional anesthesia with 0.5% lidocaine solution at a dose of 3 mg/kg was a safe, effective and well-tolerated method of anesthesia for the treatment of forearm and wrist fractures and dislocations in children. The technique is simple and easily performed in the emergency department by the orthopedic surgeon. It reduces hospital costs by avoiding admission.

We recommend that intravenous regional anesthesia be the anesthetic method of choice in the treatment of forearm and wrist fractures and dislocations in children. This method is not recommended for bilateral or open fractures or outside well-equipped emergency departments.

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Total Hip Arthroplasty in Rheumatoid Arthritis: Comparison of Cemented and Uncemented Implants

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In a group of patients who underwent total hip arthroplasty because of rheumatoid arthritis, the outcome in 42 hips was assessed. There were 17 cemented and 25 uncemented prostheses. The average follow-up was 5 years for cemented prostheses and 3 years for uncemented prostheses. The average Harris hip scores were similar in the two groups (84 and 86 respectively). Radiologically, the incidence of migration of femoral and acetabular components was similar in the two groups. Component migration was not affected by component fixation. Uncemented implants may have a role in hip arthroplasty in patients with rheumatoid arthritis.

Dans un groupe de patients qui avaient subi une arthroplastie complète de la hanche pour cause de polyarthrite rhumatoïde, on a évalué les résulats obtenus sur 42 hanches. On comptait 17 prothèses cimentées et 25 prothèses non cimentées. Le suivi moyen a été de 5 ans pour les prothèses cimentées et de 3 ans pour les prothèses non cimentées. Les indices moyens à l'échelle de la hanche de Harris ont été similaires pour les deux groupes, soit 84 et 86 respectivement. À la radiographie, la fréquence des migrations des composantes fémorales et acétabulaires a été semblable dans les deux groupes. La migration des composantes n'a pas été affectée par leur mode de fixation. Les prothèses non cimentées peuvent avoir un rôle à jouer dans les arthroplasties de la hanche pour les patients souffrant de polyarthrite rhumatoïde.

Total hip arthroplasty is a successful procedure in patients with rheumatoid arthritis. Long-term follow-up studies have shown good implant survival in patients with cemented implants.[1-3] Unger and colleagues[3] reported a success rate of 80% after 12 years. In the study of Poss and colleagues,[1] 96% of patients had relief of pain after operation.

Uncemented implants were introduced in the hope that biologic fixation would provide optimal fixation and prevent failures associated with cemented implants, thus prolonging implant survival. The early reports of total hip arthroplasty in which uncemented devices were used included patients with rheumatoid arthritis but did not separate them from the other patients.[4,5] The purpose of this review is to evaluate the role of uncemented hip implants in patients with rheumatoid arthritis and to compare the results obtained in these patients with those in a group of patients with cemented components.

Patients and Methods

Between 1981 and 1989, 48 patients with rheumatoid arthritis underwent total hip arthroplasty. In

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Accepted for publication Feb. 1, 1993

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total, 52 hips were implanted. Twenty-five hips had a cemented implant (group 1) and 27 had an uncemented implant (group 2); the choice of implant was not prospectively randomized and was the preference of the surgeon.

The age of patients in group 1 ranged from 33 to 77 years (average 60 years). The follow-up was adequate for 17 hips (8 left and 9 right) in this group. Three patients had inadequate radiographs for complete review; however, they did have Harris hip scores beyond 2 years postoperatively. Five patients had neither adequate radiographs nor clinical follow-up. The type and number of prostheses inserted were as follows: HD2, 14; Harris–Galante, 2; Mallory–Head, 1.

The age of patients in group 2 ranged from 24 to 71 years (average 57 years). The follow-up was adequate for 25 hips (8 left and 17 right) in this group. Two patients could not be located. The type and number of prostheses inserted were as follows: PCA, 19; Mallory–Head, 5; CLS (Protek), 1.

Follow-up included clinical and radiologic review. Clinical review consisted of Harris hip scoring and pain and function subscoring. Radiologic review involved evaluation of preoperative, 6-week postoperative and most recent radiographs. On the postoperative radiographs, acetabular and femoral components were evaluated as follows: The teardrop was used as a fixed reference point on the pelvis to evaluate the acetabular component.[6-8] The vertical and horizontal positions of the cup were determined as previously described.[8] The position of the cup on the most recent radiograph was compared with that on the 6-week radiograph. A change of more than 2 mm was defined as migration. Acetabular abduction was measured, and the most recent film was compared with the 6-week film. Radiolucencies about the acetabular component were also measured. For the cemented components, radiolucencies greater than 2 mm involving 50% to 99% of the implant were defined as possible loosening, and global radiolucencies greater than 2 mm were defined as probable loosening.[9,10]

Radiographic review of the femoral component consisted of measurement of vertical stem position from a fixed point on the femur on both the 6-week and final radiographs. A change in vertical position of 5 mm or more was defined as subsidence. Change in component alignment (varus or valgus) was also recorded. In the cemented components, radiolucencies were measured, and in the uncemented implants sclerotic lines were measured. Radiolucencies greater than 2 mm involving 50% to 99% of the zones defined by Gruen[11] were considered possible loosening. Likewise, lucencies greater than 2 mm globally around the prosthesis were considered probable loosening, and a shift in the component was considered as definite loosening.[10]

For the uncemented implants, which were primarily of the PCA type, evaluation of prosthesis fit as described by Callaghan, Dysart and Savory[4] was made. No analysis of metaphyseal filling could be made on the anteroposterior radiograph because of lack of endosteal definition. If on the anteroposterior radiograph the stem came in contact with the endosteum and on the lateral radiograph two of the three points of contact were made by the stem with the endosteum, the fit was good; if there was no contact with the endosteum and no three-point contact on the lateral film, the fit was poor.

Correlation between the Harris pain score and radiologic findings for the acetabular and femoral components was attempted.

Results

For group 1 implants, the average follow-up was 5 years (range from 2 to 8 years). For group 2 implants, the average follow-up was 3 years (range from 2 to 7 years).

In group 1 patients, the average Harris hip score was 84 (range from 70 to 97). The average pain score was 43 with no patient having a score less than 40. The average function score was 33 (range from 18 to 45). Eight hips were rated excellent (90 to 100); two hips were rated good (80 to 89); seven hips were rated fair (70 to 79). There were no poor results in this group. The three patients who did not have adequate radiographs but had clinical scores with a follow-up longer than 2 years had Harris hip scores of 66, 83 and 100. In all of these hips, the pain score was 44.

In group 2 patients, the average Harris hip score was 86 (range from 60 to 100). The average pain score was 42; two hips in one patient had scores of 30, and the remainder had scores of 40 or 44. The average function score was 36 (range from 16 to 47). Fourteen hips were rated excellent (90 to 100); 3 hips were rated good (80 to 89); 4 hips were rated fair (70 to 79); and 4 hips were rated poor. There were no ratings less than 60.

There were no failures or revisions in either group.

Evaluation of the acetabular component in group 1 hips demonstrated that four hips had superior migration of the component greater than 2 mm. In no hips was there medial migration greater than 2 mm. In two patients there were radiolucencies greater than 2 mm in two of three zones of DeLee and Charnley.[9] One of these hips had superior migration of 8 mm. There was no pain in the four cemented hips with superior migration (pain scores of 44 for all). The overall

Harris scores were 71, 72, 87 and 97.

In group 2 hips, three acetabular components had superior migration greater than 2 mm. Two of them were in one patient, and the pain score for both hips was 30; the pain score for the third hip was 44. One hip had medial migration greater than 2 mm, associated with a pain score of 40. No patient had a sclerotic line with a gap greater than 2 mm in any of the acetabular zones.

Two group 1 hips had subsidence of the femoral component greater than 5 mm. One hip had radiolucencies greater than 2 mm in four of the seven zones of Gruen. This patient had femoral subsidence of 8 mm but no pain. The other patient with subsidence greater than 5 mm also had no pain. Thus, two hips had radiographic evidence of definite loosening but were pain free.

Three group 2 hips had subsidence of the femoral component greater than 5 mm (pain scores 40, 40 and 30). Two of these hips had a good fit based on anteroposterior and lateral radiographs. Overall only 7 hips had a good fit, and the remaining 18 had a poor fit on either anteroposterior or lateral radiographs. No hip had a sclerotic line with a gap greater than 2 mm in over 50% of the femoral zones. One patient in this group had acute subsidence of the component (10 mm) within the first 6 weeks.

Discussion

Previous reports of total hip arthroplasty in patients with rheumatoid arthritis have shown good results.[3,12-14] With a 12-year follow-up, Unger and colleagues[3] reported a 16.7% revision rate for infection and mechanical loosening. Of the hip implants that survived, results were satisfactory in 97%. Likewise, Poss and colleagues[1] reported that 96% of patients had satisfactory results after 7 years of follow-up. In our entire group of patients, 90% had satisfactory results based on Harris hip scores. Two of the four patients with a poor rating had no pain and had low overall scores due to decreased function. The other two poor scores were in one patient with moderate pain. This patient had bilateral uncemented implants. The range of overall Harris hip scores and the average scores of 84 and 86 are lower than scores obtained for osteoarthritis because of the decreased functional ability of patients with rheumatoid arthritis.

The radiographic results in our two groups were interesting. There were no revisions for loosening of the implants in either group. Subsidence of the femoral component was defined as a change in the vertical placement of the stem greater than 5mm, as previously described by Callaghan and associates.[6] Subsidence was seen in both groups. Two femoral components in the cemented hips had definite loosening with migration of the stem greater than 5 mm but were asymptomatic. Three of the stems in the uncemented hips had subsidence but without a sclerotic line, and thus may have been loose, but specific criteria for loosening of this type of implant have not been defined.

Acetabular migration was seen in both groups. Two acetabular components in the cemented group had radiographic lucencies in two of three zones and one of these had migrated. Thus, one of the cemented acetabular components was definitely loose, and the other was defined as possibly loose. The two other cups that migrated had no radiolucencies greater than 2 mm. None of these four patients in group 1 had pain, and none of the four patients in group 2 whose acetabular cups migrated had pain. Acetabular migration in total hip arthroplasty for rheumatoid arthritis occurs more frequently when the centre of rotation of the hip is not restored.[12,13] We did not correlate the original position of the acetabulum with those components that migrated.

Acetabular failure has been reported to be higher than femoral component failure in patients suffering from rheumatoid arthritis compared with patients suffering from osteoarthritis.[1,2,13,15,16] Long-term studies have reported a slightly higher failure rate of the acetabular component in those with rheumatoid arthritis than in those with osteoarthritis. In patients with rheumatoid arthritis who underwent cemented hip arthroplasty, Unger and colleagues[3] reported acetabular loosening in 16% of hips compared with femoral loosening in 2% of hips. In a 10-year follow-up of cemented hips 35% (6 of 17) of patients with rheumatoid arthritis had acetabular loosening, a rate that was higher than in patients with osteoarthritis.[16] Poss and colleagues[1] also postulated a higher rate of acetabular failure after 5 years.

This review has demonstrated that the incidence of component migration was the same for cemented and uncemented hips with respect to both acetabular and femoral components. One postulated theory for migration of implants is that the migration may be due to periarticular osteopenia in patients with rheumatoid arthritis. Bogoch and associates[17] have described increased osteogenesis in an animal model of inflammatory arthritis. They noted a marked increase in osteoclastic activity with more newly formed bone than in nonarthritic animals. This newly formed bone may not be able to withstand the loads around the joint, and

certainly protrusio is a common condition in rheumatoid arthritis. The method of implant fixation may not have an impact on migration.

In reports of uncemented total hip replacement, small numbers of patients with rheumatoid arthritis have been included. Engh and Massin[5] included 46 patients with rheumatoid arthritis in their series of 343 hips; 74% of these hips had radiographic evidence of bone ingrowth in contrast to 82% of hips in patients with osteoarthritis. Two preliminary studies of uncemented total hip arthroplasty in patients with rheumatoid arthritis with very short follow-up reported good results clinically and radiologically.[14,18]

Although we recognize that our series was not randomized, some conclusions may be drawn. There was no difference in the clinical outcome between cemented and uncemented components. Component migration occurred in both groups. Overall, good results were obtained with cemented and uncemented hips. With advances in the understanding of bone ingrowth implants and the indications for uncemented devices postulated on femoral morphology,[19] the same criteria for an uncemented device should be applied to the patient with rheumatoid arthritis.

Surprisingly, in the group with uncemented implants, only seven had a good fit of the prosthesis. The remaining 18 prostheses were undersized, and in this circumstance one would expect subsidence and later failure. However, our results with an average follow-up of 3 years show this may not be the case. A cemented femoral stem is likely the best alternative for patients with rheumatoid arthritis when the femoral geometry will not accept an uncemented stem.

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Acute Mesenteroaxial Gastric Volvulus in an Infant: A Case Report

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Only 52 cases of gastric volvulus have been reported in children and infants. The pathophysiology of the condition relates to an abnormal rotation of the stomach.

The authors report a case of an 11-month-old infant who presented with an 8-hour history of retching and obtundation. Abdominal distension and left upper-quadrant tenderness were the predominant physical findings. A diagnosis of mesenteroaxial gastric volvulus with eventration of the left hemidiaphram was made by means of plain-films and an upper gastrointestinal series. The child underwent laparotomy and gastrostomy, made a smooth recovery and was well 36 months postoperatively.

Seulement 52 cas de volvulus de l'estomac ont été signalés chez des enfants ou des bébés. La physiopathologie de cette affection est reliée à une rotation anormale de l'estomac.

Les auteurs décrivent le cas d'un bambin de 11 mois qui a été vu après 8 heures d'efforts pour vomir et d'émoussement des sensations. Une distension abdominale et une sensibilité du quadrant supérieure constituaient les signes cliniques prédominants. Un diagnostic de volvulus mésentéro-axial de l'estomac avec éventration de l'hémidiaphragme gauche fut posé sur la foi de radiographies simples de l'abdomen et d'une série de clichés gastro-intestinaux supérieurs. L'enfant subit une laparotomie et une gastrostomie, se rétablit sans problème et il était toujours bien portant, 36 mois après l'opération.

Acute gastric volvulus is an uncommon surgical emergency. In young children radiographic examination is particularly important in making the diagnosis early, because the symptoms and signs in this age group are not as clear and reliable as in adults. We report the case of an infant with this condition who was treated successfully.

Case Report

An 11-month-old infant presented to the emergency department with an 8-hour history of irritability followed by retching without vomiting. He was afebrile and lethargic. The abdomen was distended and there was left upper-quadrant tenderness. Blood and biochemistry profiles were normal. An upright plain film of the abdomen showed a

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Accepted for publication Jan. 8, 1992

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double hemidiaphram (Fig. 1). An attempt at stomach decompression with a nasogastric tube was unsuccessful. After a brief period of conservative management with intravenous fluids, an upper gastrointestinal contrast study was done through the nasogastric tube. A high-grade gastric outlet obstruction secondary to a mesenteroaxial gastric volvulus (Fig. 2) was demonstrated. At laparotomy, eventration of the left hemidiaphram and a mesenteroaxial volvulus of the stomach without evidence of gastric wall ischemia were found. A simple gastrostomy was performed. The patient's postoperative course was unremarkable. The gastrostomy tube was removed 14 days after operation. The child was asymptomatic 3 years postoperatively.

Discussion

Gastric volvulus is an uncommon abnormality. It was first described by Berti[1] in 1866. Since then over 300 cases have been reported. Gastric volvulus is most common in adults; however, 52 cases have been reported in infants and children.[2] The pathophysiology of gastric volvulus is related to the associated congenital abnormalities: failure of fixation of the stomach due to poorly developed gastrocolic or gastrosplenic ligaments and a diaphragmatic defect such as panesophageal hernia or eventration.[3] However, up to one-third of the patients have no coexisting anomalies and represent so-called primary gastric volvulus.[4]

There are three types of gastric volvulus: mesenteroaxial — rotation of the stomach along the axis connecting the centre of the lesser and greater curvatures (Fig. 3A); organoaxial — rotation of the stomach along the axis connecting the cardia with the pylorus (Fig. 3B) and a combined type. The degree of rotation can vary from 180° to 360°.

Acute gastric volvulus is a surgical emergency. If the rotation is greater than 180° a complete obstruction with strangulation, wall ischemia, perforation and associated morbidity and mortality can result. The classic triad of symptoms, described by Borchardt,[5] in 1904, consists of retching and inability to vomit, severe epigastric pain and distension and failure to insert a nasogastric tube. In infants and young children radiographic examination is particularly important in making the diagnosis early, because the symptoms and signs in this age group are not as clear and reliable as they are in adults. The upright chest x-ray film usually shows a broad air-fluid level in the left upper quadrant. Contrast studies of the upper gastrointestinal tract reveal

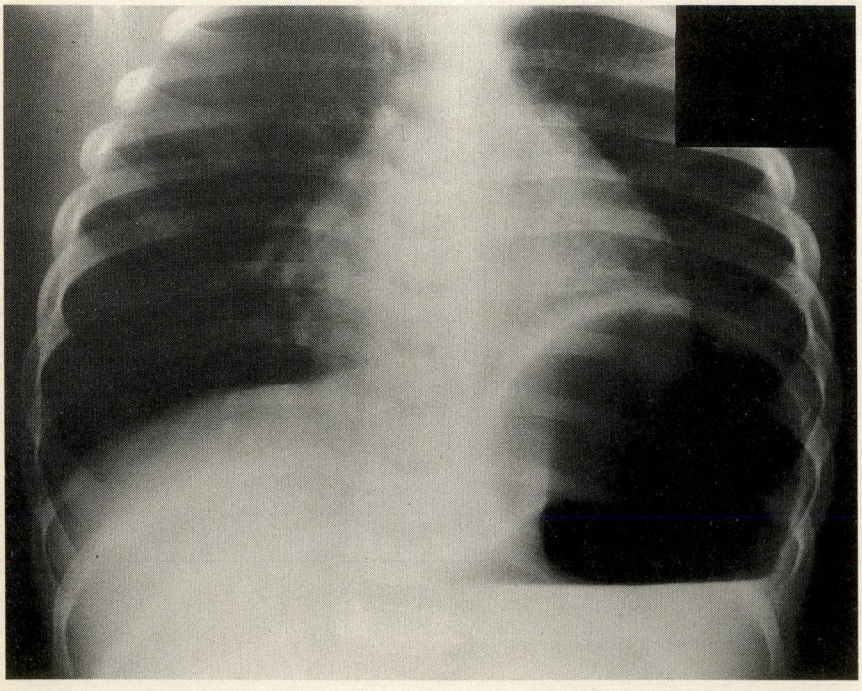

FIG. 1. Upright film of abdomen shows double air-fluid level in left upper quadrant and elevation of left hemidiaphram.

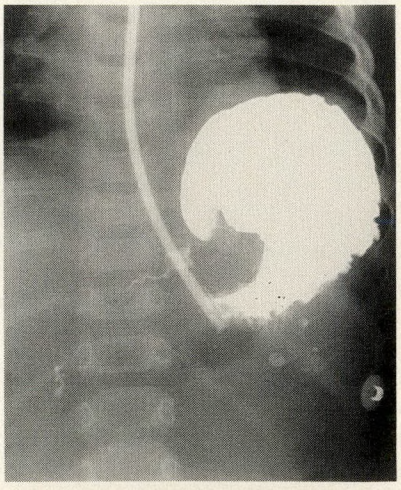

FIG. 2. Gastrografin injected through nasogastric tube demonstrates high-grade gastric outlet obstruction and "upside down" stomach.

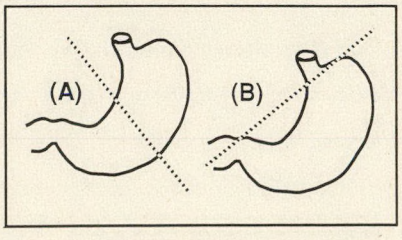

FIG. 3. Rotational axis in mesenteroaxial (A) and organoaxial (B) volvulus.

rotated or "upside down" stomach with varying degrees of inlet and outlet obstruction depending on the type and severity of the volvulus.

Chronic gastric volvulus is usually characterized by postprandial pain, bloating, vomiting and early satiety. There is often a history of chronic symptoms for months or years before presentation. A barium meal may reproduce the symptoms, and volvulus can be seen on fluoroscopy.[6] Standard upper gastrointestinal contrast studies are also useful in establishing the diagnosis. Endoscopy and therapeutic derotation of the gastric volvulus are also being used for diagnosis.[3]

Definitive treatment of this condition should be surgical. Operation consists of reduction of the volvulus, evaluation of the viability of the gastric wall and possibly repair of the associated intra-abdominal abnormalities. Recurrence can be prevented by simple gastrostomy, anterior gastropexy (with or without colonic displacement) or partial gastrectomy. The long-term results of surgical treatment have been excellent, and no recurrences have been reported.

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Diagnoses Made by Frozen-Section Examination of Surgical Specimens in a Small Canadian Hospital

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Examination of frozen sections, which is frequently used to make diagnoses at the Plains Health Centre, Regina, is expensive in terms of manpower and resources of the pathology department and should be used judiciously. The authors analysed the pathology records from January to December 1990 and found that more than 10% of surgical specimens were submitted for frozen-section diagnosis. A correct diagnosis was made in 94.8% of cases, and in approximately 1% of cases the diagnosis was deferred until paraffin sections were examined. An incorrect diagnosis by frozen-section examination was made in 4.2% of cases. In 13.2% of cases, frozen-section examination was apparently performed for reasons that were not medically legitimate. In a further 14.9% of cases the value of frozen-section examination was questionable. Clinicians need to be educated about the correct role of frozen-section examination in patient management, especially in this era of restricted hospital budgets.

L'examen des coupes en congélation, un moyen diagnostique fréquemment utilisé au Plains Health Centre de Régina, est coûteux en ce qui a trait aux ressources humaines et matérielles du service de pathologie, et on devrait y avoir recours de façon judicieuse. Les auteurs ont analysé les dossiers de pathologie de janvier à décembre 1990. Ils ont observé que plus de 10 % des prélèvements chirurgicaux furent soumis pour un diagnostic par coupe en congélation. Un diagnostic juste fut posé dans 94,8 % des cas et, dans environ 1 % des cas le diagnostic fut reporté à l'examen des coupes en bloc de paraffine. L'examen par coupe en congélation donna un diagnostic erroné dans 4,2 % des cas. Dans 13,2 % des cas l'examen par coupe en congélation a été effectué pour des raisons qui n'étaient pas valables sur le plan médical. De plus, dans 14,9 % des cas, la pertinence de cet examen pourrait être remise en question. Les cliniciens auraient besoin d'être formés sur le rôle des examens par coupes en congélation dans le traitement des malades, particulièrement en cette époque de restrictions budgétaires en milieu hospitalier.

The use of frozen sections to render a rapid diagnosis in surgical pathology has been practised in many laboratories for decades.[1] The prime purpose of this technique is to provide the surgeon with the information required for immediate management of the patient.[2] This information usually includes the diagnosis of a benign versus a malignant lesion, the presence or absence of metastatic disease or the

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**Supported by a research grant from the Plains Health Centre*

Accepted for publication Mar. 23, 1992

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presence of a tumour at resection lines and confirmation of the presence of diseased tissue in the excised sample. Occasionally, the diagnosis rendered at the time of frozen section also determines the immediate further handling of tissues in the laboratory. For example, a breast carcinoma will be submitted frozen for hormone-receptor analysis, inflamed tissues may be subjected to special culturing, and lymphomas may be processed for cell-marker and cytogenetic studies.

Despite the many advantages of diagnosis by frozen section, the technique is less reliable than traditional histopathologic examination of processed, paraffin-embedded tissues, because frozen tissues become distorted, sections obtained using the cryostat and staining of unprocessed tissues are often of poor quality, sampling of the surgical specimen is limited and the demand for a rapid diagnosis produces psychologic pressure. Furthermore, the inability to apply special staining or immunohistochemical procedures may be disadvantageous. Thus, frozen sections are only advisable in clinical situations when rapid diagnosis is essential for the immediate management of the patient or handling of the specimen, and in which the disadvantages of the technique are outweighed by the advantages of immediate diagnosis. Use of the frozen-section technique to provide a rapid diagnosis for social reasons, to communicate the diagnosis rapidly to the patient's relatives or to satisfy the curiosity of the surgeon should be discouraged because of the potential for error, the high cost to the laboratory in terms of manpower and stress and the potential for hampering the ultimate proper evaluation of the specimen.

It was noted that an unusually high proportion of surgical pathology specimens at the Plains Health Centre were being submitted for frozen-section examination. Accordingly, a survey was conducted to investigate the reliability of the frozen-section technique at the hospital, to assess the rate of frozen-section examinations and to attempt to assess the validity of the requests for frozen-section examination.

Materials and Methods

All frozen sections prepared in the pathology laboratory of the Plains Health Centre, Regina, in 1990 were reviewed. Each specimen was examined grossly by a pathologist, a sample was taken, and the sample was embedded in ornithine carbamyl transferase-compound frozen-section medium and frozen rapidly in the cryostat. Sections were then cut, stained with toluidine blue and hematoxylin and eosin and examined by the pathologist. In some cases, especially for small biopsy samples of brain neoplasms, smears rather than tissue sections were prepared. The frozen-section diagnosis was communicated to the operating room through an intercom system. A report was compiled immediately, and the report was compared with the final histopathology report. A copy was retained with the pathology record. A decision was made as to whether the frozen-section diagnosis correlated with the final histologic diagnosis from the paraffin sections. Any inconsistencies between the frozen-section diagnosis and the final histologic diagnosis were categorized according to the reasons for the discrepancy.

Specimens were grouped according to anatomic sites, and the validity of the request for frozen-section diagnosis was assessed, retrospectively, from information available to the pathologist. The information was based on factors such as the age of the patient, the nature of the disease, the type of surgical procedure, the location of the operating room in which the surgical procedure was conducted, the likelihood of a reliable diagnosis using frozen section of a small sample of the lesion in each case and the intent of the surgeon in changing the immediate management of the patient, depending on the frozen-section result. Thus, requests for frozen-section diagnosis were judged to be "indicated", "not indicated" or "of uncertain benefit."

Table I. Results of Frozen-Section Examination of Fresh Surgical Tissue

Pathologist	Total no. specimens	No. correct	No. incorrect	Diagnosis deferred	% error
A	87	81	4	2	4.6
B	265	253	10	2	3.8
C	239	226	11	2	4.6
Other	5	5	0	0	0
Total	596	565	25	6	4.2

Results

There were 596 requests for frozen-section diagnosis out of a total of 5852 surgical specimens. Breast tissue was the biopsy material submitted most frequently for frozen-section diagnosis (159 cases, 27%). Excised skin lesions were also commonly submitted for frozen-section diagnosis and for assessment of resection margins. Other tissues for which biopsy specimens were commonly obtained included lung, lymph node and thyroid.

The frozen-section diagnosis correlated with the final histologic diagnosis in 565 cases (94.8%). In 25

cases (4.2%) the frozen-section diagnosis differed from the final histologic diagnosis, and in 6 cases (1%) the diagnosis was deferred because a definite decision could not be made at the time of frozen section (Table I). The overall error rate was approximately 4.2% and was similar for the three pathologists who reported on most of the specimens. Reasons for the incorrect diagnosis are given in Table II. Errors resulted from misinterpretation of the frozen-section slide in 12 cases (Table III). Errors also resulted from failure to sample the lesion correctly macroscopically (11 cases) or when the lesion was present in the blocks submitted for frozen section but was not included in the prepared slide and was revealed only on deeper cutting of the block (2 cases) (Table IV).

A breakdown of cases submitted for frozen-section diagnosis according to anatomic site is shown in Table V, which also summarizes the validity of the request for each type of surgical specimen.

Retrospective assessment of the validity of the requests for frozen-section examination revealed that 79 (13.2%) of the 596 cases were considered to have insufficient indication for frozen-section examination. Twenty-four (15%) of the 159 breast lesions should not have been submitted for frozen-section examination. This conclusion was based on the fact that the breast lesions were thought to be benign clinically and had been excised in the outpatient department with no plan to proceed with further surgery should the frozen section show a malignant lesion. Most of these specimens had been sent for a rapid diagnosis for social reasons (to allay the patient's anxiety or to provide an immediate answer for the patient's relatives). Similarly, the requests for frozen-section examination of parotid-gland neoplasms (13 cases) were usually for the purpose of obtaining a rapid diagnosis to satisfy the curiosity of the surgeon rather than for obtaining information that would modify the immediate surgical management of the patient.

In some cases, the validity of the request for frozen-section diagnosis based on the information available to the pathologist was uncertain. The indication for frozen sections in the diagnosis of thyroid nodules was difficult to assess in 37 of 47 cases because of the limited success of the frozen-section technique in distinguishing between benign and malignant follicular lesions of the thyroid from a single section obtained from the periphery of the tumour. Similarly, frozen-section diagnosis of small or occult breast lesions detected by mammography (28 of the 159 cases) is usually inadvisable and is probably contraindicated in the majority of cases.

Table II. Discrepancies Between Frozen-Section Diagnosis and Final Histologic Diagnosis

Reason	No. of cases
Interpretation error	12
Macroscopic sampling error	11
Microscopic sampling error	2

Discussion

The role of the frozen-section technique in providing immediate intraoperative diagnosis of disease processes has been established in most major hospitals for many years.[3,4] The rapid diagnosis is often helpful in allowing the surgeon to proceed immediately with a more definitive surgical operation or may influence the surgeon to modify the

Table III. Cases in Which an Interpretation Error Occurred at the Time of Frozen-Section Examination ($n = 12$)

Clinical lesion	Frozen-section diagnosis	Final diagnosis
Brain tumour	Ependymoma?	Gliosarcoma
	Probable germinoma	Pituitary adenoma
	Gliosis	Astrocytoma (grade 1)
Cerebellar tumour	Adenocarcinoma (cystic)	Neuroepithelial cyst
Lung tumour	Small cell carcinoma	Atypical carcinoid
	Inflammatory process?	Bronchioloalveolar carcinoma
	Carcinoma	Carcinoid
Thyroid tumour	Follicular adenoma	Papillary carcinoma
Anal biopsy	Condyloma	Squamous carcinoma
Skin tumour	Basal cell carcinoma	Squamous carcinoma
Skin tumour	Basal cell carcinoma	Squamous carcinoma
Breast tumour	Intraductal carcinoma?	Epitheliosis

Table IV. Cases in Which Sampling Was the Cause for Incorrect Frozen-Section Diagnosis

Clinical diagnosis	No. of cases	Frozen-section diagnosis	Final diagnosis
Breast mass	3	Intraductal carcinoma	Invasive duct carcinoma
		Fibroadenosis	Invasive carcinoma
		Periductal fibrosis	Intraductal carcinoma
Breast lesion	2	Fibroadenosis (2)	Lobular carcinoma in situ (2)
Thyroid mass	4	Multinodular goitre (2)	Focal papillary carcinoma (2)
		Atypical adenoma	Follicular carcinoma
		Follicular adenoma	Follicular carcinoma
Skin lesion	2	No tumour seen (2)	Residual basal cell carcinoma (2)
Renal tumour	1	Hemangioma	Adenocarcinoma
Cerebellar mass	1	Hemosiderin, fibrin	Hemangioblastoma

operation in preparation for further therapy at a later date. For example, the diagnosis of a malignant neoplasm may result in the surgeon performing a more radical resection so as to avoid a further operation later; absence of tumour at resection lines may allow more conservative excision of a skin lesion; and, for operations at deep sites, frozen-section diagnosis of a malignant neoplasm may allow the surgeon to insert radiopaque markers at specific anatomic sites to facilitate the planning of subsequent radiotherapy. However, the frozen-section technique often falls short of the paraffin-section technique in providing the ideal standard of pathological diagnosis. The limitations of the technique are inherent in the limited sampling of the specimen, the relatively poor quality of sections and staining compared with paraffin sections, and the psychologic stress induced when the pathologist is forced to make a rapid decision.

Errors are made with frozen-section diagnoses in all laboratories and by all pathologists. The percentage error rate in the series of cases we studied is similar to that reported recently by Oneson, Minke and Silverberg[5] but greater than that reported in several other large studies[6,7] in which the error rate was less than 2%. However, even on examination in retrospect very few of the errors appear to have been avoidable. Although small, the error rate remains significant in all hospitals and tends to vary with the site of the biopsy and the nature of the disease process.[5,8,9] In the diagnosis of neoplasms of the breast, which constitute the majority of frozen-section samples at most hospitals, the technique is particularly reliable.[10,11] Fortunately, despite the occasional errors in diagnosis, there were no major negative implications for the patients in this study.

Although the frozen-section rate at the Plains Heath Centre appears to be high, the request for frozen-section examination was considered to be contraindicated in only 13.2% of cases and of uncertain indication in a further 14.9% of cases. By contrast, other workers have reported that almost half the frozen-section examinations performed in some hospitals in the United States were not indicated.[12] The high rate of frozen-section examination at the Plains Health Centre may be explained in part by the case mix of surgical procedures performed at the hospital, which is a major referral centre for neurosurgery and thoracic surgery, in addition to the usual complement of general surgery and plastic surgery.

Use of frozen sections by the plastic surgeons appears to vary according to the preferred manner of individual practice. Some prefer to excise skin tumours according to margins defined as free of tumour by frozen-section examination, whereas others prefer to excise tumours according to clinical judgement and perform further excision later if the margins are found to be involved at paraffin-section examination or when clinical recurrence occurs. Mohs' technique is not used at the Plains Health Centre.

The value of frozen-section examination for diagnosis of nodules of the thyroid gland is also debatable. Only a small percentage of thyroid nodules are malignant, and many of those are misdiagnosed as benign lesions by frozen-section examination because of inadequate sampling of the capsular zone in follicular neoplasms. This problem occurred in four cases in the pres-

Table V. Analysis of Frozen Sections According to Specimen Type or Anatomical Site and Whether Frozen-Section Examination Was Indicated

Type of tissue examined	Frozen-section examination			
	No.	Indicated	Not indicated	Uncertain
Skin	82	79	0	3
Breast	159	107	24	28
Brain	54	50	3	1
Lung ± hilar node	60	53	3	4
Thyroid	47	6	4	37
Lymph node	58	44	8	6
Prostate	18	18	0	0
Bladder	13	11	1	1
Mouth/tongue	10	9	1	0
Kidney	6	6	0	0
Pituitary	5	0	4	1
Parathyroid	5	5	0	0
Liver	5	2	2	1
Salivary gland	13	0	13	0
Adrenal	2	0	2	0
Thymus	4	3	1	0
Colon/ileum	14	8	4	2
Stomach	8	6	1	1
Nasopharynx	1	0	1	0
Testis/vas deferens	5	5	0	0
Gallbladder	3	3	0	0
Esophagus	3	3	0	0
Retroperitoneum	4	4	0	0
Pancreas	3	2	0	1
Ovary	3	1	2	0
Post mediastinum	2	1	0	1
Bone	4	1	2	1
Soft tissue	4	1	3	0
Spleen	1	0	1	0
Total	596	428	79	89
%	100	71.8	13.2	14.9

ent series. Rosen, Rosenblatt and Saltzman[13] recently reported a sensitivity of only 53% for the diagnosis of malignancy on frozen-section examination of 504 specimens of thyroid nodules. In many centres, most small, well-differentiated intrathyroidal carcinomas of both papillary and follicular type are treated by lobectomy alone with long-term results not significantly worse than those in patients subjected to more radical surgery.[14] If this surgical policy is followed, there is even less justification for a frozen-section diagnosis in most patients with thyroid nodules.

Recent developments in the surgical management of small breast tumours, especially nonpalpable lesions detected by screening mammography, are essentially conservative, and the operative procedure is rarely altered regardless of the diagnosis of the lesion as benign or malignant. The disadvantages of frozen-section examination in this situation are considerable, because accurate diagnosis of small breast carcinomas often requires sections of the highest quality. Tissue distorted by freezing and cut before adequate fixation may be rendered unsuitable for accurate interpretation and for reliable assessment of resection margins. Furthermore, recent studies on the use of frozen sections in the diagnosis of small invasive and in situ breast lesions have shown an increasing percentage of deferred diagnoses (up to 20%) and false-negative diagnoses (up to 76%), which reflects the difficulty of interpretation.[15,16]

Conclusions

We have shown that despite the high rate of frozen-section examinations at the Plains Health Centre, only a small percentage of frozen-section examinations are judged to be contraindicated. Most of these were performed for psychosocial reasons and should be discouraged in the future. The percentage of unnecessary frozen sections would be greater if the cases of thyroid nodules were included in the contraindicated category. The frozen-section technique has proved to be relatively reliable and remains a useful tool in the diagnostic armamentarium of the pathology laboratory.

We thank the administration of the Plains Health Centre for permission to publish this report.

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Magnetic Resonance Imaging in Preoperative Localization of Diseased Parathyroid Glands: A Comparison With Isotope Scanning and Ultrasonography

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The value of magnetic resonance imaging (MRI) in the preoperative localization of parathyroid glands was assessed through a comparison of the findings with those obtained by ultrasonography and isotope scanning.

The localization findings in 37 patients with primary hyperparathyroidism were compared with the operative findings. The sensitivities of the three modalities as defined by the ability to detect a parathyroid adenoma were 67% (isotope scanning), 44% (ultrasonography) and 36% (MRI). The differences were not significant. The sensitivities as defined by the ability to predict the correct side of the lesion were 48% (isotope scanning) 33% (ultrasonography) and 36% (MRI).

No correlation was found between the sensitivity of a given localization test and factors such as the presence of thyroid abnormalities, size of the lesion, type of lesion and preoperative calcium and parathormone levels.

The low sensitivity and high cost of all three preoperative localization studies render them unnecessary in the management of uncomplicated parathyroid disease. However, if preoperative imaging is necessary, ultrasonography and isotope scanning are recommended, since MRI was not found to be superior.

On a évalué l'importance de l'imagerie par résonnance magnétique (IRM) utilisée en préopératoire pour localiser les parathyroïdes au moyen d'une comparaison des résutats obtenus par cette méthode avec ceux de l'échographie et ceux de la scintigraphie.

Les résultats des examens de localisation de 37 patients souffrant d'hyperparathyroïdie ont été comparés aux observations opératoires. La sensibilité des trois méthodes, telle que définie par leur capacité de déceler un adénome parathyroïdien fut de 67 % (scintigraphie), 44 % (échographie) et 36 % (IRM). La sensibilité telle que définie par la capacité de prédire le côté exact de la lésion fut de 48 % (scintigraphie), 33 % (échographie) et 36 % (IRM).

Aucune corrélation n'a pu être établie entre la sensibilité de l'un ou l'autre des tests de localisation et des facteurs tels que la présence d'anomalies thyroïdiennes, la taille de la lésion, le type de lésion et les taux préopératoires de calcium et de parathormone.

La faible sensibilité et les coûts élevés des trois modes d'examen de localisation les rendent inutiles pour le traitement des pathologies parathyroïdiennes non compliquées. Toutefois, s'il s'avère nécessaire d'obtenir une visualisation préopératoire, l'échographie ou la scintigraphie devraient être préférées à l'IRM puisque cette dernière ne s'est pas montrée supérieure.

The definitive treatment for hyperparathyroidism is surgical removal of the diseased parathyroid glands. The surgical risks of such a procedure include damage to the recurrent laryngeal nerves and postoperative hypoparathyroidism. Preoperative localization studies may minimize these surgical risks by

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Accepted for publication Feb. 16, 1993

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directing the surgeon to the area of disease and limiting the extent of dissection; moreover, it is important to gain experience in preoperative localization so that abnormal glands can be localized in more difficult cases, such as in patients who require re-exploration.

Ultrasonography (US) and thallium-technetium subtraction scintigraphy (TTSS) are widely used noninvasive techniques for localizing glands, but the value of magnetic resonance imaging (MRI) in this area has not been fully addressed. In this study, the value of MRI was assessed through a comparison with US and TTSS of sensitivity at three levels: detection of the lesion, prediction of the correct side and localization to the specific quadrant. Factors such as the presence of thyroid abnormalities, lesion size, disease type and preoperative calcium and parathormone levels were also examined to determine their correlation, if any, with the sensitivity of a given test.

Patients and Methods

Thirty-seven patients (27 women, 10 men) with primary hyperparathyroidism confirmed by elevated calcium and parathormone levels underwent one or more localization tests between July 1987 and April 1990. The patients ranged in age from 21 to 87 years. Seven were asymptomatic, 6 complained of general fatigue or depression, 24 presented with urolithiasis or other renal complications and 9 presented with bone pain or decreased bone density.

All patients were operated on by the same surgeon, who knew the results of all localization studies before operation. None of the patients had undergone neck exploration. All had surgically confirmed parathyroid lesions. All had normal calcium levels postoperatively and were considered cured, with the exception of one patient who had persistent hypercalcemia after three and one-third glands were removed because of hyperplasia. One patient had a palpable mass in the neck on physical examination.

All MRI examinations were performed in 1989 with the nonupgraded Signa 1.5 T by GE Medical Systems Canada (Mississauga, Ont.), in conjunction with a surface neck coil. T_1- and T_2-weighted images were obtained for both the transverse and coronal sections of the neck. Real-time ultrasonography was done with the Diasonics DRF 400 device (Diasonics Canada Lté, Dollard Des Ormeaux, Que.) with a 7.5-mHz transducer. Neck images with TTSS were acquired after the injection of 1.5 mCi of technetium 99m and again after the injection of 2 mCi of thallium 201. Subtraction of the technetium from the thallium images by the computer yields an image of hyperfunctional parathyroid glands.

Six patients had TTSS only, 7 had US only, 12 had TTSS and US only, 2 had TTSS and MRI only, 1 had MRI and US only and 9 had all three tests. All three tests were not performed on every patient because of logistical difficulties, not because of clinical considerations.

The result of each localization study was compared with the operative findings, which were the standard. A false-negative finding indicated failure of the test in detecting the lesion whereas, a true-positive finding signified that the test succeeded in detecting the lesion. The sensitivity of each modality at the three levels of localization was analysed by Fisher's exact test for any differences. The prediction of laterality was considered incorrect if the test failed to report the side on which a lesion was found or if it reported both sides when the lesion was found on one side only. Similarly, the quadrant was considered to be predicted correctly if the test reported all the diseased glands and none of the normal glands.

Results

All patients in this study had confirmed parathyroid disease; thus, there were no true-negative or false-positive results, which made it unnecessary to consider the specificity and the negative predictive value. The positive predictive value was 100% in all instances. Operative findings revealed solitary adenoma in 34 patients, multiple adenomas in 1 patient and multiple hyperplasia in 2 patients. The two patients with hyperplasia were excluded from the calculations of sensitivity.

The sensitivity values of TTSS, US and MRI at the three levels of localization are tabulated in Table I. The sensitivity of TTSS, US and MRI in detecting parathyroid adenoma was 67%, 44% and 36% respectively. These differences were not significant.

When a given test successfully detected the adenoma, the probability of it predicting the correct laterality was 73%, 75%, and 100% for TTSS, US and MRI respectively (Table II). These values were not significantly different.

Similarly, when the test successfully predicted the correct side, the probability of it predicting the correct quadrant was 15%, 78%, and 25% for TTSS, US and MRI respectively (Table III). Only four of the TTSS reports specified the quadrant of the lesion whereas all the US and MRI reports attempted to localize the lesion to the specific quadrant.

In comparisons of combinations of any two tests, both must be true positive to constitute a true-positive result for that combination. The

sensitivity for each combination in detecting a lesion was TTSS plus US 43%, TTSS plus MRI 18% and US plus MRI 10% (Table IV). These values were lower than those for the respective individual tests but were not significantly different among themselves.

In the 12 patients who had MRI, the sensitivity of each modality in detecting a lesion was TTSS 55%, US 40% and MRI 33% (Table V). The differences between these values were not significant.

Thyroid abnormalities were found in five patients; four of them had benign thyroid nodules and one had Hashimoto's thyroiditis with hyperplasia and multiple foci of papillary carcinoma. TTSS was done in two of these patients and gave a true-positive result in both cases; MRI was used in three patients and gave a true-positive result in each case. All five patients had US and two of these were true positive. From this small sample, abnormality of the thyroid did not seem to have a negative effect on the sensitivity of any of the localization tests.

Among patients who had parathyroid adenoma, the preoperative ionized calcium levels, available in 22 patients, ranged from 1.33 to 2.94 mmol/L. Preoperative parathormone levels, available in 29 patients, ranged from 6.4 to 69 pmol/L. The adenoma size, available in 34 patients, ranged from 0.004 to 11.5 cm^3. The null hypotheses that adenoma size, preoperative parathormone and ionized calcium levels had no effects on the ability of each individual test to detect the lesion were not rejected, with a p value of < 0.01 by the Wilcoxon rank-sum test. Therefore, this study was unable to correlate adenoma size, parathormone or calcium levels with the sensitivity of the localization tests.

In the two patients with parathyroid hyperplasia, TTSS and US gave a true-positive result, while MRI reported a false-negative result on the only case in which it was used.

Table I. Sensitivity of Thallium-Technetium Subtraction Scintigraphy (TTSS), Ultrasonography (US) and Magnetic Resonance Imaging (MRI) in Detecting a Parathyroid Adenoma and Correctly Predicting the Side and Quadrant

Modality	Patients, no.	Detection of adenoma, %	Correct prediction of	
			Side, %	Quadrant, %
TTSS	27	67	48	7
US	27	44	33	26
MRI	11	36	36	9

Table II. Probability That TTSS, US and MRI Will Predict Correct Side of Adenoma When the Test Has Detected It

Modality	Patients with adenoma detected, no.	Correct prediction of side, %
TTSS	18	73
US	12	75
MRI	4	100

Table III. Probability That TTSS, US and MRI Will Predict Correct Quadrant of Adenoma When the Test Has Correctly Predicted the Side

Modality	Patients with side predicted correctly, no.	Correct prediction of quadrant, %
TTSS	13	15
US	9	78
MRI	4	25

Table IV. Sensitivity in Detecting an Adenoma of Different Combinations of Two Techniques Considered as a Single Test on the Same Patient

Combination of modalities	Patients, no.	Sensitivity in detecting lesion, %
TTSS + US	21	43
TTSS + MRI	11	18
US + MRI	10	10

Table V. Sensitivity of Each Modality for All Patients Who Had MRI

Modality	Patients, no.	Sensitivity, %
TTSS	11	55
US	10	40
MRI	12	33

Discussion

The sensitivities of the three modalities in detecting parathyroid disease were not significantly different. These sensitivities were lower than those reported by Erdman and associates[1] (US 77% and MRI 81%), but the sensitivity of TTSS (65%) was comparable to that of our review. The sensitivity of MRI in our study was also significantly lower than the range of 64% to 79% reported by Higgins and Auffermann[2] in the review of several studies. The discrepancy in the sensitivity of MRI between this study and previous studies could be attributed to the different quality of machines, because in this study first-generation MRI equipment was used.

Congruent with the findings of Erdman and associates,[1] comparison of the different combinations of tests showed no significant difference in sensitivity although the sensitivity of a combination of two tests was definitely lower than that of the individual tests alone.

Rafto and Seften[3] reported that all modalities were less sensitive in detecting multigland hyperplasia than in detecting adenomas. Stein and Wexler[4] also found that US and TTSS were less sensitive with respect to hyperplasia. In MRI studies, this difficulty could be attributed to the similar intensity given by hyperplastic glands in T_1- and T_2-weighted images relative to that of thyroid tissue.[5] Although TTSS and US were able to detect hyperplastic glands in our study, the small number of cases made it impossible to draw conclusions regarding the type of disease and its effect in localization studies.

The presence of thyroid adenoma or cyst can complicate MRI interpretation by giving a high-intensity signal on the T_2-weighted image, thus giving a false-positive result.[1,2] Such an effect was not found in this study as there were no false-positive results. In the patient who had Hashimoto's thyroiditis, MRI succeeded in detecting the parathyroid lesion, because this modality can differentiate diffuse from focal disease. For example, Hashimoto's thyroiditis can be distinguished from toxic multinodular goitre on MRI.[3]

The results indicated that there was no correlation between sensitivity for a given test and adenoma size. Contrary to previous studies that reported difficulty in identifying parathyroid glands less than 0.5 cm in diameter with TTSS,[6-8] the smallest adenoma, with a maximum dimension 0.2 cm, was detected by both TTSS and US in this study. The hypothesis that higher levels of calcium and parathormone may be indicative of more active and thus more easily detected parathyroid glands was disproved, because no correlation could be found between these two variables and the sensitivity of each modality. These findings were similar to those of Stein and Wexler,[4] which also failed to correlate the weight of the adenomatous gland and the degree of physiological hyperfunction with the sensitivity of US and TTSS.

Since imaging techniques are obtained only after investigations have indicated surgical exploration of the parathyroid to be necessary, and since they have a sensitivity of 80% at best,[9] it may be questioned whether imaging should be done at all. Localization studies may help the surgeon plan the strategy for an operation. Results in this study indicated that if TTSS, US or MRI succeeded in detecting the lesion, the modality would also be likely to predict laterality correctly. Therefore, unilateral neck exploration would be justified in cases of solitary adenoma if surgical findings corresponded with reports from localization studies and if the other gland on the side of the lesion was normal. Surgical complications such as hypocalcemia, which may result from extensive dissection and biopsy of all four glands, are thus minimized without the risk of persistent hypercalcemia being significantly increased. This view was also supported by Stein and Wexler.[4]

The estimated costs per test of the three imaging techniques were: TTSS $285, US $75 and MRI $1400. If any of these imaging techniques were to be used, US would be the one of choice initially because of its relatively low cost and ability to localize the lesion to the specific quadrant. Although MRI is superior to the other two techniques when the neck anatomy is distorted by previous surgery, it is not recommended if metallic surgical clips have been used. Although the new non-metallic surgical clips allow for safe use of MRI, they may create artifacts which, in such a small area as the neck, can render the scans useless.

The sensitivity of MRI in detecting parathyroid adenomas was relatively less than that of US or TTSS. Its use can only be justified when difficulty in identifying parathyroid disease is anticipated. Given their high cost and limited sensitivity, preoperative localization studies are unnecessary in the management of uncomplicated parathyroid disease.

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Piperacillin Versus Cefazolin Given Perioperatively to High-Risk Patients Who Undergo Open Cholecystectomy: A Double-Blind, Randomized Trial

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Objective: To study the efficacy, microbiologic features and toxicity of prophylactic cefazolin versus prophylactic piperacillin in high-risk patients who undergo open cholecystectomy.
Design: Double-blind randomized trial with follow-up for 6 weeks postoperatively.
Setting: An 850-bed community hospital, located in a major Canadian city. Patients admitted to hospital who satisfied published criteria for being at high-risk for infection after open cholecystectomy were entered into the protocol, and those who satisfied the criteria and provided consent were entered into the study. Eighty-one patients were randomly assigned by computer to receive either piperacillin or cefazolin as the prophylactic agent.
Interventions: Open cholecystectomy.
Main outcome: Provides detailed information on the organisms found in the biliary tree in patients with acute cholecystitis, assesses the in-vitro activity of cefazolin versus piperacillin against the isolated organisms, expecting that piperacillin would be much more active against isolated anaerobes and gram-negative bacteria.
Results: Bactobilia was documented in 42% of patients in the cefazolin group and 29% of patients in the piperacillin group. Piperacillin was active in vitro against 94% of all isolates versus 56% for cefazolin ($p < 0.005$, McNemar's test). Adverse effects and toxicities in both the piperacillin and cefazolin group were low and were not serious.
Conclusions: Both piperacillin and cefazolin are safe and effective prophylactic antimicrobials for high-risk patients who undergo open cholecystectomy. However, piperacillin had a much wider spectrum of in-vitro activity against the isolated pathogens, especially *Enterococcus* sp., *Enterobacter cloacae* and the anaerobes.

Objectif : Étudier l'efficacité, le spectre antibactérien et l'innocuité d'un traitement prophylactique à la céfazoline contre ceux de la pipéracilline prophylactique chez des patients à risque élevé qui subissent une cholécystectomie ouverte.
Conception : Un essai randomisé à double insu, avec un suivi postopératoire de 6 semaines.
Contexte : Un hôpital communautaire de 850 lits situé dans une grande ville

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Supported by Lederle, Cyanamid (Canada).

Accepted for publication Nov. 23, 1992.

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canadienne. Les patients hospitalisés qui rencontraient les critères reconnus de risque élevé d'infection après une cholécystectomie ouverte, qui satisfaisaient les critères et qui étaient consentants furent inclus dans l'étude. Quatre-vingt-un patients furent assignés au hasard, par ordinateur, à recevoir soit de la pipéracilline ou de la céfazoline, comme traitement préventif.

Intervention : Une cholécystectomie ouverte.

Principaux paramètres : Obtenir une information détaillée sur les microorganismes (aérobies et anaérobies) retrouvés dans les voies biliaires chez les patients souffrant de cholécystite aiguë, comparer les activités in vitro de la céfazoline et de la pipéracilline contre les bactéries isolées, en supposant que la pipéracilline allait s'avérer beaucoup plus active contre les isolats anaérobies et les bactéries gram négatif.

Résultats : Une bactobilie fut constatée chez 42 % des patients du groupe céfazoline et 29 % des patients du groupe pipéracilline. La pipéracilline était active in vitro contre 94% des isolats, par rapport à 56 % pour la céfazoline ($p < 0,005$, test de McNemar). Les effets secondaires ou toxiques des deux antibiotiques ont été peu nombreux et peu graves.

Conclusions : La pipéracilline aussi bien que la céfazoline sont des antibiotiques sûrs et efficaces comme traitement préventif chez les patients à risque élevé qui doivent subir une cholécystectomie ouverte. La pipéracilline avait cependant un spectre d'action in vitro beaucoup plus vaste contre les bactéries isolées, surtout *Enterococcus* sp., *Enterobacter cloacae* et les isolats anaérobies.

Antimicrobial prophylaxis for biliary tract surgery in elective[1-3] and high-risk patients[4-6] reduces wound sepsis and bacteremia. The antimicrobials recommended for such prophylaxis are first-generation cephalosporins, such as cefazolin, because of their in-vitro activity against organisms isolated from the infected biliary tree and their high level of biliary excretion.[7-9] Cefazolin is active against *Escherichia coli*, the commonest isolate in the biliary tree, but is generally inactive against enterococci, the second commonest isolate (13% to 16%),[10-12] and against anaerobes (*Clostridium perfringens, Peptostreptococcus* sp. and *Bacteroides* sp.), which are occasionally isolated (in up to 20% of cases) from the biliary tree.[8,11]

Piperacillin is also active against many of the gram-negative aerobes isolated from the biliary tree, including *E. coli, Klebsiella* sp., *Proteus* sp., *Enterobacter* sp. and the gram-positive *Enterococcus*.[13-16] Also, piperacillin is active against *Pseudomonas* sp., whereas cefazolin is not,[13] and against anaerobes. Finally, piperacillin achieves high concentrations in the biliary tree (bile-to-serum ratio greater than 4:1) and is excreted by this route.[14,17]

The efficacy, safety and relative lack of toxicity of piperacillin has been established in the treatment of serious infections as well as in the prophylaxis of surgical procedures.[18,19]

This study was undertaken to examine the bacteriologic features and in-vitro sensitivities of isolates from the gallbladder and to compare the safety and efficacy of piperacillin versus cefazolin in the prophylaxis of high-risk patients who undergo open cholecystectomy. In addition, the sensitivity to piperacillin and cefazolin of all bacteria isolated from nonbiliary sites of infection were examined.

Patients and Methods

The study was conducted in a prospective, randomized, double-blind manner. There were 103 patients at high risk for postoperative infection after open cholecystectomy. Patients considered to be at high risk were those over 70 years old and those who had acute cholecystitis, obstructive jaundice, common bile duct stones, previous biliary surgery, chills and fever within 1 week of admission, acute cholecystitis within 1 month of admission or decreased host defences due to diabetes, uremia or immunosuppressive drugs.

The 103 patients were randomly allocated by computer to receive piperacillin or cefazolin prophylaxis. Statistical analyses included McNemar's test for matched pairs.[20]

The criteria for inclusion were as follows:

- Any patient, over the age of 18 years, admitted to hospital for open cholecystectomy, who was at increased risk for infection.
- The absence of infection outside the biliary tree according to the history and physical examination.

Criteria for exclusion were:

- Antimicrobial therapy within 7 days of entry into the study.
- A history of hypersensitivity to penicillin or cephalosporins.
- Pregnancy.
- Organisms cultured from blood samples taken preoperatively.

Twenty-two patients were exclud-

ed from the study because of a change of antimicrobials (4 patients) and lack of bile cultures (18 patients). Therefore, the charts of 81 patients who satisfied the criteria were analysed.

Antimicrobial Use

Both antimicrobials were administered by intermittent intravenous infusion over 30 minutes; the first dose (piperacillin 2.0 g, cefazolin 1.0 g) was given on call (less than 1 hour) to the operating room and then every 6 hours postoperatively for 24 hours.

Conduct of the Study

A complete clinical evaluation form detailing the patient's history, presenting complaints and physical findings was completed. The laboratory tests carried out preoperatively and postoperatively are detailed in Table I. All patients were apprised of the aims of the study and the possible risks and the benefits and signed a consent form approved by the Ethics Subcommittee of the Research Committee of St. Joseph's Health Centre.

Table I. Investigations Carried Out Preoperatively and Postoperatively on 81 High-Risk Patients Who Underwent Open Cholecystectomy

Preoperatively
Complete blood count and differential count
Serum alanine aminotransferase, serum aspartate aminotransferase and total bilirubin measurements
Serum urea nitrogen, creatinine, electrolytes and fasting plasma glucose measurements
Blood culture
Urinalysis
Abdominal ultrasonography
Chest radiography
Postoperatively
Complete blood count and differential count
Serum alanine aminotransferase, serum aspartate aminotransferase and total bilirubin measurements
Serum urea nitrogen, creatinine, electrolytes and fasting plasma glucose measurement
Urinalysis

Gallbladder bile specimens obtained at operation from all patients were cultured aerobically and anaerobically. Operative findings and exact surgical procedures were documented. Postoperatively, patients were evaluated for drug toxicity and evidence of infection, including wound sepsis. The follow-up was for 6 weeks.

All isolates were identified by standard criteria.[13] Sensitivity patterns of facultative bacteria were determined by the agar dilution method[14] with the multiple inocula device on undivided plates,[15] and by the Kurzynski method for anaerobic bacteria.[16] The following quality-control organisms were tested daily throughout the study: *E. coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 25923 and *Streptococcus faecalis* ATCC 33186. Bacterial isolates, infections and any change in laboratory parameters were compared for both groups.

Results

The distribution of the 81 patients in the study according to the inclusion criteria are summarized in Table II; 40 received cefazolin and 41 received piperacillin. The patients ranged in age from 22 to 82 years (mean 55 years) in the cefazolin group and from 23 to 86 years (mean 58 years) in the piperacillin group. The female-to-male ratio was 3:1 in the cefazolin group and 3.6:1 in the piperacillin group. The leukocyte count was elevated preoperatively in 22 (55%) patients in the cefazolin group and 23 (56%) in the piperacillin group. There were no bacteremic episodes preoperatively in either group.

Acute cholecystitis at surgery was confirmed in 25 (62%) patients in the cefazolin group and 22 (54%) patients in the piperacillin group. Intraoperative cholangiography for possible common bile duct stones was done in 11 patients in the cefazolin group and 9 patients in the piperacillin group.

Cultures of bile grew bacteria in 17 (42%) of 40 patients in the cefazolin group and 12 (29%) of 41 patients in the piperacillin group. In patients from the cefazolin group, 18 (95%) of 19 organisms were sensitive to piperacillin, whereas 12 (63%) of 19 isolates were sensitive to cefazolin. In the piperacillin group, 14 (93%) of 15 isolates were sensitive to piperacillin, whereas only 7 (47%) of 15 were sensitive to cefazolin. A combination of all the isolates demonstrated that 32 (94%) of the 34 isolates were sensitive to piperacillin whereas only 19 (56%) were sensitive to cefazolin (McNemar's test, $p < 0.005$) (Table III).

Table II. Distribution of the 81 Patients According to Inclusion Criteria

	Patients, no.	
Inclusion criterion	**Cefazolin group**	**Piperacillin group**
Age > 70 yr	4	3
Acute cholecystitis	25	22
Obstructive jaundice, common-bile-duct stones or both	5	5
Chills and fever within 1 wk	1	2
Acute cholecystitis within 1 mo	3	5
Decreased host defences	2*	4†
Total	40	41

*Diabetes mellitus
†1 uremia, 3 diabetes mellitus

Clearly, piperacillin provides better coverage for gallbladder isolates than cefazolin.

During the 6-week follow-up there were no changes in the leukocyte count, liver function test results or serum creatinine levels, and there were no adverse reactions attributable to the antimicrobials in either of the two groups.

Three patients in each group had postoperative infections. Two from the cefazolin group had a urinary tract infection and one had a wound infection. Specimens from the wound infection grew *Enterobacter cloacae* that was resistant to cefazolin. None of the isolates of the three infections correlated with those of the gallbladder bile specimens. One patient in the cefazolin group had common bile duct exploration for stones, and two patients had acutely inflamed gallbladders. Two patients from the piperacillin group had wound infections due to *Klebsiella pneumoniae* and *Bacillus pantothenticus* respectively, and a third patient had postoperative pneumonia, urinary tract infection and a right subhepatic collection of pus which grew *Klebsiella pneumoniae, Klebsiella oxytoca, P. aeruginosa* and *Enterococcus* sp.). All three patients with obstructive jaundice underwent exploration of the common bile duct. None of the isolates of the five infections correlated with the results of gallbladder cultures.

Table III. Organisms Isolated From Gallbladder Specimens in the Two Groups and the Sensitivities of the Organisms to Cefazolin and Piperacillin

Organisms	Cefazolin group			Piperacillin group		
	No. of isolates	Sensitivity to		No. of isolates	Sensitivity to	
		Cefazolin	Piperacillin		Cefazolin	Piperacillin
Escherichia coli	4	4	4	2	2	2
Enterobacter cloacae	3	0	3	3	0	3
Klebsiella pneumoniae	2	2	2	2	2	1*
Klebsiella oxytoca	0	0	0	2	1	2
Pseudomonas aeruginosa	0	0	0	1	0	1
Pseudomonas acidovorans	1	0	1	0	0	0
Enterococcus sp	3	0	2*	2	0	2
α-hemolytic *Streptococcus*	3	3	3	1	1	1
Staphylococcus aureus	1	1	1	0	0	0
Bacillus sp	0	0	0	2	1	2
Peptococcus anaerobius	1	1	1	0	0	0
Clostridium perfringens	1	1	1	0	0	0
Total†	19‡	12	18	15§	7	14

*One of two *Klebsiella pneumoniae* isolates and one of three enterococcal isolates showed moderate sensitivity to piperacillin.
†McNemar's test, $p < 0.005$
‡From 17 patients
§From 12 patients

Table IV. Sensitivity Patterns of Organisms Isolated From Different Sites of Infection in the Study Groups

Site of infection	Group	No. of infections	Organism	No. of isolates	Sensitivity to cefazolin/ piperacillin*
Subhepatic space	Piperacillin	1	*Klebsiella pneumoniae*	1	S/S
			Klebsiella oxytoca	1	S/S
			Pseudomonas aeruginosa	1	R/S
			Enterococcus sp	1	R/S
Sputum	Piperacillin	1	*Escherichia coli*	1	S/S
			Proteus mirabilis	1	S/S
			Staphylococcus aureus	1	S/S
Urine	Cefazolin	2	*Providencia rettgeri*	1	R/S
	Piperacillin	1	*Escherichia coli*	1	S/S
			Staphylococcus epidermidis	3	S/S
Wound	Cefazolin	1	*Bacillus pantothenticus*	1	R/S
	Piperacillin	2	*Enterobacter cloacae*	1	R/S
			Klebsiella pneumoniae	1	R/S
Total†		8‡		15	S/S = 9 R/S = 6

*S = susceptible, R = resistant
†McNemar's test, $p < 0.001$
‡Includes different sites of infection in one patient

In addition, the third patient in the piperacillin group had uremia and was in the intensive care unit for 1 month. The sensitivity patterns of the organisms that were isolated from different sites of infection in both groups are summarized in Table IV.

When all the isolates from the gallbladder and other sites of infection were combined, a total of 48 microorganisms from 19 different species were identified. Only 29 (60%) of the 48 organisms were sensitive to cefazolin, but all (100%) were sensitive to piperacillin ($p < 0.001$, McNemar's test).

Discussion

The results of this randomized, prospective, double-blind trial of cefazolin versus piperacillin revealed no differences in toxicity, adverse effects or infection rates, immediately postoperatively or during the 6-week follow-up in either group of patients.

The average incidence of positive bile culture in both groups (42% in the cefazolin group and 29% in the piperacillin group), is similar to that reported in the literature.[2,8] The commonest organism in our study was *E. coli*, which is also reported as the commonest bile isolate in most series. The second commonest isolate found in most studies, as in this one, was *Enterobacter* sp. Piperacillin was 100% effective against *Enterobacter* sp., whereas cefazolin had no effect.

The incidence of wound infection was about 3% in our series, and there were no significant differences between the two groups. All wound isolates were sensitive to piperacillin but not to cefazolin. There was no correlation between the organisms grown from the infected wound and those grown from gallbladder cultures in any of our patients. Since most wound infections after biliary tract surgery are caused by organisms isolated from bile,[2,8,11] we conclude that prophylaxis was effective in both groups. This study also presents data that clearly show the marked superior in-vitro efficacy of piperacillin over cefazolin in the treatment of high-risk patients who undergo open cholecystectomy. All species isolated from both gallbladder specimens and postoperative sites of infection were sensitive to piperacillin. Cefazolin was ineffective against *Enterococcus* sp., *E. cloacae, P. aeruginosa, Pseudomonas acidovorans, Providencia rettgeri* or *B. pantothenticus*. Only 2 of 48 isolates showed moderate sensitivity to piperacillin, 1 *Enterococcus* isolate (1 of 6) and 1 *Klebsiella pneumoniae* isolate (1 of 5).

One paper studied the efficacy of piperacillin in elective biliary surgery; the dosage was 2 g, intramuscularly, 2 hours preoperatively, followed by 2 g, intravenously, at the beginning of the operation.[21] Blood levels of piperacillin exceeded 100 mg/L in all cases adhering to the dosage regimen, which was well above the minimal inhibitory concentration for most strains of *E. coli, Proteus* sp., *Staphylococcocus albus, Pseudomonas* sp., *S. faecalis* (enterococci) and nonhemolytic streptococci. Both gallbladder and common bile duct levels of piperacillin exceeded 50 mg/L.[21] Only 1 of 50 patients had an infection postoperatively.

In our study, postoperative urinary sepsis and pneumonia, although more common in the piperacillin group, could not be related to perioperative prophylaxis. Similarly, the organisms grown from the one subhepatic complication did not correlate with the gallbladder isolates in that patient.

We conclude that both piperacillin and cefazolin are safe and effective prophylactic antimicrobials for high-risk patients who undergo open cholecystectomy. In vitro, piperacillin has advantages over cefazolin due to greater coverage against *Enterococcus*, anaerobes and *E. cloacae*. Piperacillin was shown to be as effective as cefazolin in our study.

Table V. Sensitivity to Cefazolin and Piperacillin of all Isolates

Organism	No. of isolates	Sensitive to*	
		Cefazolin	Piperacillin
Escherichia coli	8	8	8
Enterobacter cloacae	6	0	6
Klebsiella pneumoniae	5	5	5
Klebsiella oxytoca	2	1	2
Pseudomonas aeruginosa	3	0	3
Pseudomonas acidovorans	1	0	1
Proteus mirabilis	1	1	1
Providencia rettgeri	1	0	1
Staphylococcus aureus	2	2	2
Staphylococcus epidermidis	5	5	5
Enterococcus sp	6	0	6
Streptococcus mitis	1	1	1
Streptococcus salivarius	1	1	1
Streptococcus intermedius	1	1	1
Viridans streptococci	1	1	1
Bacillus pantothenticus	1	0	1
Bacillus sp	1	1	1
Peptostreptococcus anaerobius	1	1	1
Clostridium perfringens	1	1	1
Total	48	29	48

*Including moderately sensitive

The secretarial assistance of Mrs. I. Monteith is greatly appreciated, as are the contributions of the microbiology laboratory technologists.

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SESAP VII Critique / Critique SESAP VII

Item 169

Clostridium difficile is isolated in 2% to 3% of healthy adults, 10% to 15% of hospitalized patients without diarrhea, 5% to 15% of adults without diarrhea who have recently received antimicrobials, and 90% to 100% of patients with antibiotic-associated diarrhea or colitis with positive toxin assays. Toxin detection, the preferred diagnostic method for *C. difficile*-induced diarrhea, gives a better clinical correlation than stool cultures. Most cases of pseudomembranous colitis observed during the past four decades have been associated with antimicrobial usage, but the disease has occasionally been seen in patients after operation or those who have other acute or chronic illnesses, and even rarely in previously healthy persons with no recent antimicrobial exposure and no other identified risk factor. Although *Staphylococcus aureus* was once believed to be an etiologic agent, most cases are now caused by *C. difficile*. The treatment is oral antimicrobial agents, most commonly vancomycin or metronidazole.

B

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Subtotal Splenectomy and Portal Variceal Disconnection in the Treatment of Portal Hypertension

Andy Petroianu, MD

Bleeding gastroesophageal varices caused by portal hypertension can be treated successfully by subtotal splenectomy and central splenorenal shunting. However, in elderly patients and those at high risk of hepatic failure, congestive heart failure and encephalopathy or when splenorenal anastomosis is impossible, an alternative is subtotal splenectomy and portal variceal disconnection. The author reports on the first nine patients who underwent this procedure and describes the operative technique. Complications of the operation were minimal. One patient had thrombocytosis, but this was controlled clinically. No patient experienced encephalopathy during a follow-up ranging from 10 months to 8 years. No rebleeding was noted in seven of the patients, but two had a bleeding duodenal ulcer, which was treated successfully. Liver function was preserved in all patients. These results have encouraged the author to continue investigation of subtotal splenectomy and portal variceal disconnection.

Les hémorragies de varices gastro-oesophagiennes causées par une hypertension porte peuvent être traitées avec succès par splénectomie sous-totale et par dérivation splénorénale centrale. Toutefois, chez les patients âgés et chez ceux qui sont à risque élevé de souffrir d'insuffisance hépatique ou cardiaque, ou d'encéphalopathie, ou quand il est impossible de réaliser une anastomose splénorénale, l'alternative consiste à pratiquer une splénectomie sous-totale avec interruption de la circulation porte vers la varice. L'auteur décrit les neuf premiers cas qu'il a soumis à cette intervention, de même que la technique opératoire. Les complications opératoires sont minimes. Un patient a souffert d'une thrombocytose qui fut maîtrisée cliniquement. Aucun patient n'a souffert d'encéphalopathie pendant la période de suveillance qui va de 10 mois à 8 ans. Aucune nouvelle hémorragie n'est survenue chez sept patients; deux ont toutefois eu des hémorragies d'ulcères duodénaux, lesquelles furent traitées avec succès. La fonction hépatique a pu être préservée dans tous les cas. Ces résutats ont stimulé l'auteur à poursuivre ses recherches sur les effets à long terme de la splénectomie sous-totale avec interruption de la ciculation porte vers la varice.

Life-threatening hemorrhage due to gastroesophageal varices is an indication for operation in patients with portal hypertension.[1-6] The standard treatments for this condition consist of portal–systemic shunting, portal-variceal disconnection and endoscopic sclerotherapy of esophageal varices.[1-3,5-10]

Shunting procedures seem to be the most effective treatment. However, these methods may result in postoperative problems such as hepatic failure, cardiopulmonary congestive dysfunction and encephalopathy,[4,5,7-9,11] especially in patients older than 50 years.[1,3,7,9,11] Another surgical option for high-

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Accepted for publication July 20, 1992

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risk patients is total splenectomy and portal-variceal disconnection. This avoids hepatic, cardiopulmonary and cranial complications but may be harmful to hematologic and immunologic systems due to removal of the spleen.[3,5-7,9,12]

Since 1981, investigators at the Federal University of Minas Gerais, Belo Horizonte, Brazil, have studied, experimentally and clinically, the treatment of portal hypertension by subtotal splenectomy and central splenorenal shunting.[4,13-18]

The first 11 patients who underwent this procedure for the management of variceal bleeding due to portal hypertension caused by schistosomiasis all had an uncomplicated postoperative course. Rebleeding, encephalopathy and hepatic and cardiopulmonary failure were not reported during a 9-year follow-up. The size of the varices decreased, and the size and function of the splenic remnants were unchanged.

Despite these good results, the use of this procedure in elderly patients, those with previous signs of encephalopathy and those with hepatic or cardiopulmonary dysfunction is still of concern. For such patients, the use of subtotal splenectomy and portal-variceal disconnection is proposed. The successful treatment of nine patients (seven men, two women) by this method is described.

Patients and Methods

The patients, ranging in age from 14 to 60 years (mean [±SD] 40.1 ± 16.2 years), who had hematemesis and melena due to infection with *Schistosoma mansoni* were admitted to the Division of Digestive Surgery at the Hospital of Clinics of the Federal University of Minas Gerais. All patients were classified as having Child's group A hepatopathy. They had hepatosplenomegaly and bleeding from gastroesophageal varices. Two of the patients were scheduled to undergo subtotal splenectomy and central splenorenal shunting,[4,13] but the splenic vein could not be released from strong fibrotic adhesions to the pancreas. Six patients had severe pancytopenia. One patient had psychiatric problems. Two others had previously suffered from hepatitis, but the liver function test results were normal. Another patient had pulmonary hypertension due to schistosomiasis. Four patients (42, 56, 57 and 60 years old respectively) were considered to be at risk for splenorenal anastomosis because of their age. One of them had heart failure.

The Operation

In seven of the patients, the abdominal cavity was entered through a supraumbilical median incision. In the other two patients, who were to have splenorenal anastomosis, the approach was by a diagonal left subcostal incision. The peritoneum was carefully opened to avoid damage to the umbilical vein. The splenic artery was ligated in the retrogastric space after division of the greater omentum. The spleen was gently displaced upward and its ligaments were divided between ligatures or with electrocautery. The splenic hilum was dissected and ligated with 2-0 silk sutures. Care was taken to preserve the splenogastric vessels.

The subtotal splenectomy was performed at the level of the spared splenogastric vessels. Two wide flaps (anterior and posterior) of the splenic capsule were retained. The bleeding large vessels of parenchyma were sutured with 3-0 chromic catgut. Minor bleeding was controlled with a continuous tight suture of the parenchyma with 0 chromic catgut on a 5-cm needle. A second continuous suture of 0 chromic catgut was used to close the two flaps of splenic capsule (Fig. 1). When hemostasis was complete, the splenic stump was replaced in its normal position.

Portal-variceal disconnection was achieved by tying the left and right gastric veins and all posterior gastric veins with 2-0 or 3-0 silk. The

FIG. 1. Upper pole remnant of spleen after subtotal resection shows continuous suture of parenchyma (arrowhead) and closure of capsule.

veins of the gastric lesser curvature were carefully tied to avoid damage to the vagal branches or the gastric wall. All vessels surrounding the lower third of the esophagus and cardia were also tied. After careful revision, the abdomen was closed.

Results

The duration of operation ranged from 2.5 to 3 hours. Blood loss was minimal and no blood transfusion was necessary. Technetium-99m sulfur colloid scintigraphy on the day after the operation demonstrated the viability of the splenic remnants in all patients (Fig. 2). The pancytopenia had resolved by the 3rd postoperative day in all cases. Thrombocytosis (platelet count up to 2100×10^9/L) developed in one patient during the 1st month postoperatively, but resolved without further complications after careful clinical monitoring and administration of acetylsalicylic acid (2 g/d). The platelet count 5 months after operation was 310×10^9/L.

No signs of encephalopathy were noted during a follow-up that ranged from 10 months to 8 years. No variceal rebleeding was noted in seven patients, but the other two each had a duodenal ulcer, successfully treated with ranitidine. Liver function was preserved in all patients. Esophagogastroscopy done several months after operation revealed a reduction in variceal size. No other major or minor complications were reported.

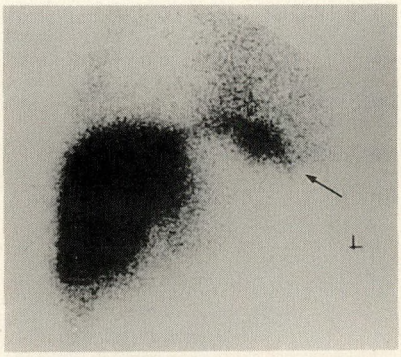

FIG. 2. Image obtained from technetium-99m sulfur colloid scintigraphy on day after subtotal splenectomy and portal-variceal disconnection demonstrates viability of liver and spleen (arrow).

Comment

Segmental splenectomy has been reported since the last century, but it was only after the report of Campos Christo[19] that this procedure introduced into surgical practice.[4,13,19,20] Subtotal splenectomy has been carried out in cases of trauma and some hematologic illnesses to preserve the immunologic function of the spleen.

The rationale for subtotal splenectomy in portal hypertension is to retain the advantages of total splenectomy without losing splenic function.[4,5,7,9,11,13] Our experimental and clinical studies demonstrated that it is unnecessary to preserve the splenic hilum to maintain the viability and function of the upper pole.[4,13-16,18]

The interruption of blood flow from the spleen directly to the portal vein reduces the blood volume and pressure in the portal system. However, I believe that at least part of the splenic blood reaches the portal vein through the gastric veins. On the other hand, experimental studies have described effective splenic function even when part of this organ is transplanted out of the portal circulation.[21,22] Investigations at the Federal University of Minas Gerais showed that the remnant upper pole and the splenogastric vessels do not interfere with portal hypertension or gastroesophageal varices.[4,13]

The blood pressure of the upper pole of the spleen vascularized by the splenogastric vessels was reduced, and serious blood loss during the subtotal splenectomy was thereby avoided. In my experience, continuous suture of splenic parenchyma has been sufficient to provide complete splenic hemostasis.

Follow-up scintigraphy and computed tomography showed that splenic function was maintained and that the dimensions of the splenic remnants were unchanged during the years of follow-up. Hematologic studies confirmed the complete resolution of the pancytopenia in all cases. Liver function is rarely altered by schistosomiasis, and none of our patients, including the two who had had hepatitis, presented such complications perioperatively.

Subtotal splenectomy and central splenorenal shunting continues to be performed successfully for portal hypertension. However, this procedure is contraindicated for patients at high risk of hepatic failure or who have cardiopulmonary congestive dysfunction or encephalopathy. Subtotal splenectomy and portal-variceal disconnection appears to be a satisfactory option in these circumstances and when splenorenal anastomosis is impossible.

The value of partial preservation of the spleen has been shown in the management of trauma and some hematologic conditions.[19-23] The small number of patients and the follow-up of 9 years are not enough to confirm the advantages of this procedure on portal hypertension. However, the absence of infectious complications and the normal hematologic test results over the years indicate preservation of immunologic function by the remnant spleen. These findings together with the experimental and clinical studies demonstrating effective capture of foreign colloids by the macrophages of the remnant spleen[4,14-17] support the efficacy of our surgical technique of subtotal splenectomy and portal-variceal disconnection as an alternative treatment for portal hy-

pertension in elderly and high-risk patients.

I thank the staff of the Division of Digestive Surgery, Hospital of Clinics, Federal University of Minas Gerais, for help in managing the patients, and CNPq, PRPq-UFMG and FAPEMIG for financial support.

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Multiple Intrahepatic Cholesterol Stones

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The authors report a case of multiple intrahepatic cholesterol stones found in an asymptomatic patient who had undergone cholecystectomy 12 years before. Biochemical abnormalities and radiologic and pathologic findings are noted. The patient underwent liver resection with Roux-en-Y choledochojejunostomy and received ursodeoxycholic acid postoperatively. Recovery was uncomplicated, and the patient was well at 1-year follow-up. Intrahepatic cholesterol lithiasis is rare but can be diagnosed preoperatively. Treatment depends on the presence of complications and the distribution of the stones.

Les auteurs décrivent un cas de calculs de cholestérol intrahépatiques multiples découverts chez une patiente asymptomatique qui avait subi une cholécystectomie 12 ans plus tôt. Ils signalent les irrégularités biochimiques, radiologiques et pathologiques observées. La patiente subit une résection hépatique avec cholédochojéjunostomie de Roux-en-Y et reçut l'acide ursodeoxycholique en période postopératoire. La guérison se fit sans complication et la patiente se portait bien un an après l'opération. La lithiase intrahépatique due au cholestérol est rare mais elle peut être diagnostiquée avant l'intervention chirurgicale. Le traitement dépend des complications et de la répartition des calculs.

Intrahepatic gallstones may be produced in the gallbladder and migrate into the bile duct or may arise primarily in the bile ducts. Duct stones originating in the gallbladder may be of the pigment or cholesterol type, depending on the nature of the stones in the gallbladder, although cholesterol stones in the bile duct may lead to the formation of brown pigment stones later by inducing stasis and bacterial overgrowth in the bile ducts.[1] Intrahepatic stones originating in the gallbladder are usually few in number and are found in association with extrahepatic choledocholithiasis. Among patients with gallstone disease in Western countries, Simi and colleagues[2] and Lindstrom[3] have reported frequencies of intrahepatic stones of 0.6% and 1.3%, respectively. This frequency may reach 24% in patients with choledocholithiasis.[4] Primary duct stones are almost always of the pigment type. They are usually caused by a parasitic infection of the biliary tree.[5] In East Asia, where this problem is most common, the occurrence of intrahepatic stones is almost 10%,[6,7] and it is not unusual to find patients with hundreds of intrahepatic pigment gallstones.[8,9] Cholelithiasis may coexist.

Reports of large numbers of intrahepatic gallstones of the cholesterol type are rare. To our knowledge there has only been one such case documented by detailed chemical analysis of the stones and description of the clinical presentation and treatment.[10] Several other case reports from Japan have reported on patients who almost certainly had multiple intrahepatic stones, but either the stone type was diagnosed on morphologic grounds or the method of analysis was not given.[11,12] We present another case of multiple intrahepatic cholesterol gallstones and discuss the management of this rare condition.

Case Report

A 38-year-old woman, born in Greece, was referred because of abnormal findings on liver function testing, which was performed because she complained of lack of energy. In Greece, 22 years earlier,

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Accepted for publication Mar. 29, 1992

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she had been hospitalized for 10 days for an acute episode of icteric hepatitis. Twelve years before she had had an attack of biliary colic complicated possibly by mild acute pancreatitis. A cholecystectomy was done, but operative cholangiography was not performed. The gallbladder contained a single, yellow, strawberry-like calculus, and cholesterolosis and chronic cholecystitis were present. The patient became asymptomatic postoperatively.

On examination the patient was well nourished (she weighed 69 kg and was 170 cm tall), and aside from a well-healed subcostal cholecystectomy scar, findings on physical examination were normal. The serum bilirubin level was normal. Liver enzyme levels were moderately elevated, the aspartate aminotransferase level was 73 U/L (normal less than 35 U/L), the alanine aminotransferase level was 168 U/L (normal less than 55 U/L) and the gamma glutamyl transferase level was 179 U/L (normal 8 to 80 U/L). The alkaline phosphatase level and complete blood count were within normal limits. Hepatitis-B markers, as well as examination of stools for ova of parasities, were negative.

On ultrasonography, multiple shadowing lesions compatible with gallstones were seen in the common bile duct and in the left lobe of the liver (Fig. 1A). Abdominal computed tomography (CT) showed substantial dilatation of the intrahepatic biliary tree, particularly on the left side, with no sign of external compression or stricture of ducts but with numerous large stones in the common bile duct (Fig. 1B). Percutaneous transhepatic cholangiography (PTC) confirmed dilated ducts, which contained hundreds of stones of varying sizes within the large and small ducts of the left lobe of the liver and extending into the common bile ducts (Fig. 1C). A fever developed after this procedure. A diagnosis of cholangitis was made, and the patient was operated on electively after the cholangitis had responded to antibiotics.

Operation

At operation the bile duct was found to be dilated to about 2 cm in diameter, and stones could be palpated along its length. Through a choledochotomy, multiple large stones were removed from the common bile duct, common hepatic duct and left hepatic ducts and perhaps the main right duct. Choledochoscopy revealed a clear ductal system in the right lobe and stones blocking the left main duct. A left lateral segmentectomy was performed. The left lateral segmental duct was very large (2 cm) as were its branches, and several hundred stones were removed from it. These stones, as well as those in the extrahepatic bile ducts, were smooth, facetted and white, and spilled out of the ductal system. Once the segment was resected it was possible to remove additional stones from the left medial segment. Repeat choledochoscopy revealed that the residual biliary tree was free of stones. Particular care was taken to evaluate the patency of the ductal system, and there was no evidence of strictures in the biliary tree. The left segmental duct was oversewn. A side-to-side Roux-en-Y choledochojejunostomy was performed in such a way that the anastomosed intestine was carried slightly onto the right hepatic duct, so that the left duct orifice opened directly into the loop. To provide easy access should recurrent stones develop, the side of the efferent limb was sewn to the anterior abdominal wall about 15 cm from the anastomosis.

When the patient was discharged 9 days after operation, she tolerated a full diet. She was started on ursodeoxycholic acid, 250 mg/d. No complications were recorded during her hospitalization.

Pathological Findings and Biochemical Analysis

Liver sections showed prominent intrahepatic biliary dilatations lined with cuboidal epithelium that did not exhibit excessive proliferative activity and in some areas contained inspissated bile. Cell infiltration in periportal areas by granulocytes was common (Fig. 2A). Liver cells appeared compressed by periductal tissue with concentric "onion-skin" fibrosis (Fig. 2B). Despite some increase in periportal fibrous tissue, the delicate reticulin framework of the liver parenchyma was intact with no changes indicative of cirrhosis (Fig. 2C). Stone analysis was performed by standard techniques. Stones were weighed, crushed and placed in hexane. Cholesterol was measured by gas-liquid chromatography. The stones were found to be 99% cholesterol by weight.

Follow-up

The clinical course was uncomplicated. Five months after surgery, signs and symptoms of a duodenal ulcer developed. The ulcer was successfully treated with H_2-receptor blocking agents. An abdominal CT scan revealed no abnormalities and all liver function test results were normal. The patient was well 1 year after surgery.

Discussion

Intrahepatic cholesterol stones may originate from the gallbladder and be missed at cholecystectomy, especially if cholangiography is not performed. It is also possible that cholesterol stones rarely form in the

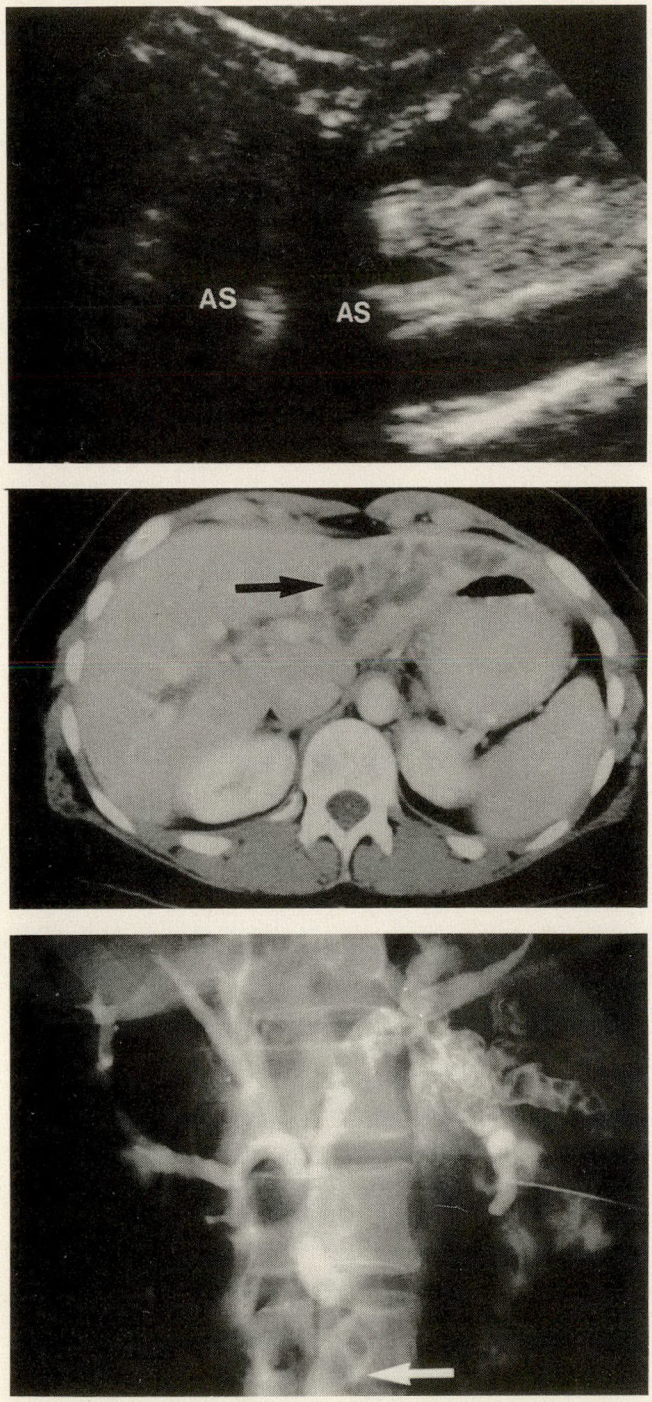

FIG. 1. Radiologic findings in patient with multiple intrahepatic cholesterol stones. (Top) Ultrasonogram of left hepatic lobe shows dilated bile ducts which contain multiple acoustic shadows (AS) of various sizes. (Middle) Computed tomography scan confirms dilatation of intrahepatic biliary tree, particularly on left (arrow), with no sign of external compression. (Bottom) Percutaneous transhepatic cholangiogram demonstrates hundreds of stones of many sizes within large and small ducts of left hepatic lobe, extending into common bile ducts (arrow).

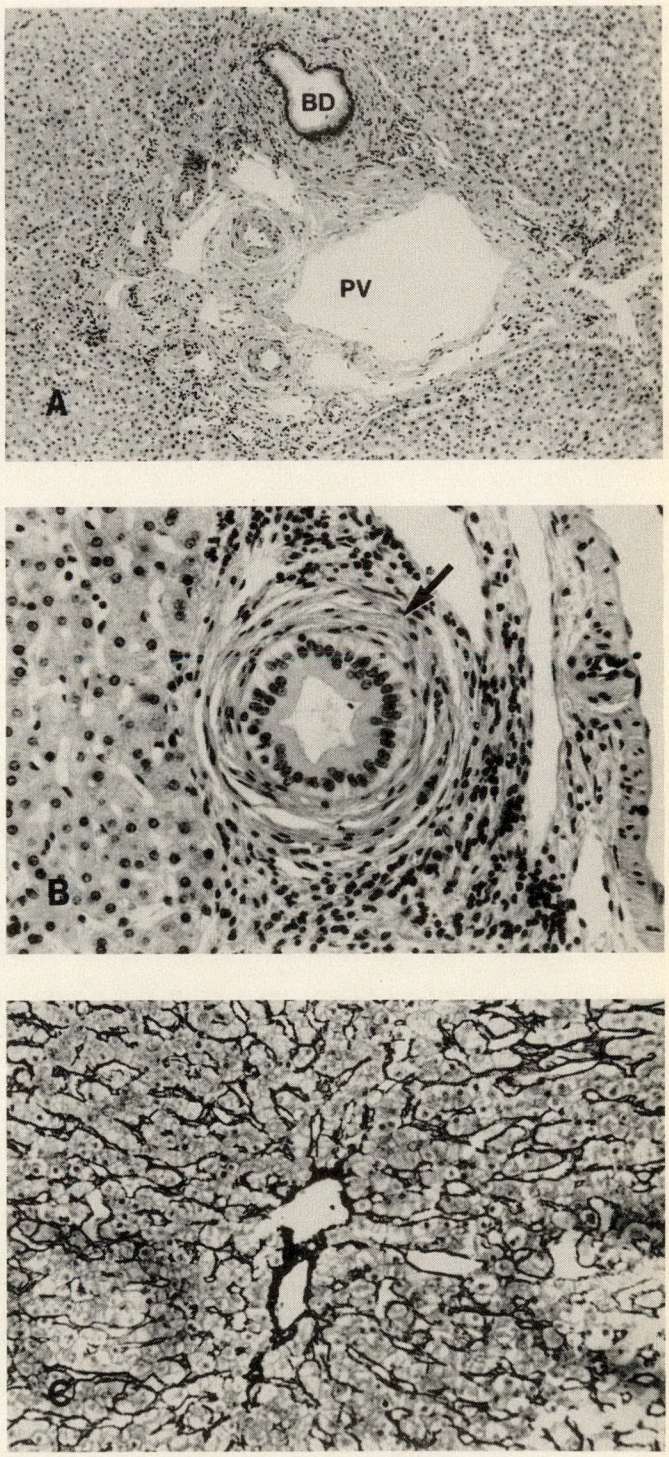

FIG. 2. (A) Liver section shows prominent biliary dilatations (BD) with cell infiltration by granulocytes around portal area (PV) (hematoxylin–eosin, original magnification × 125). (B) "Onion-skin" fibrosis of periductal tissue (arrow) which appears to compress adjacent liver cells (hematoxylin–eosin, original magnification × 750). (C) Staining for fibrous tissue shows intact reticulin framework of liver parenchyma (Mallory's triple stain, original magnification × 250).

ductal system or that they increase in size in the ductal system. Although one cannot deny conclusively that stones were missed at the original operation, the bulk of the cholesterol stones must have formed in the bile ducts. In the left ductal system small stones filled the smaller ducts and large stones filled the main ducts. The mass of stones recovered was large, and the choledochus was very wide and stuffed with large and easily palpated stones. It seems inconceivable that before cholecystectomy this mass of stones emptied itself from the gallbladder, leaving only one stone behind, that it distributed itself according to size exclusively in the left ductal system and that a surgeon missed the very obvious ductal findings at the initial operation. On the other hand one cannot completely rule out the possibility that a myriad of tiny stones that were originally in the gallbladder passed into the ductal system and grew in it. In the latter case, finding these large, exclusively cholesterol stones is still remarkable because they grew in the ductal system as cholesterol and not pigment calculi.

Cholesterol gallstones do not form normally in the bile ducts. Although hepatic bile is supersaturated with cholesterol and is usually more supersaturated than gallbladder bile, the supersaturation is due to the dilute state of the bile as opposed to the presence of greater amounts of cholesterol.[13,14] The supersaturated but dilute hepatic bile usually takes several days to nucleate cholesterol crystals.[14] This is much slower than the less saturated but more concentrated gallbladder bile.[14] Even within the gallbladder it has been shown that concentration favours nucleation.[15] The stability of hepatic bile is likely owing to the fact that at the concentration of lipids present in hepatic bile most cholesterol is carried in vesicles with a low cholesterol-to-phospholipid ratio.[16] As bile becomes concentrated, lipid shifts from vesicle to micelle, resulting in vesicles with high cholesterol-to-phospholipid ratios that are prone to nucleate cholesterol crystals.

There are several reasons why cholesterol stones might form in the bile ducts. The bile duct system is capable of water absorption,[17] although normally this is offset by secretion, especially after meals. It seems possible that rarely, perhaps particularly after cholecystectomy, duct reabsorption might be increased to a point where hepatic bile reaches a concentration at which nucleation of cholesterol is possible. Another less likely possibility is that hepatic lipid secretion rates may result in bile so supersaturated with cholesterol that nucleation from dilute bile will occur. Finally, it is possible that pronucleating substances might induce lipid shifts at dilute concentrations that are only found normally in concentrated bile or induce nucleation in dilute bile by some other mechanism. Stricture formation and infection are common etiologic events in the much more common problem of multiple intrahepatic pigment gallstones.[1,5,18,19] There were no strictures in the ductal system nor was there evidence of infection, although there was fibrous reaction in the ducts. The ease with which the stones fell out of the ductal system was much different from what is found in pigment intrahepatic lithiasis, in which the stones seem almost to adhere to the duct walls.

Our patient was either asymptomatic or had very mild symptoms. The cholangitis that occurred followed investigation by PTC and resolved. The decision to treat was based on the belief that such multiple intrahepatic stones are likely to cause complications. The preoperative diagnosis was multiple pigment-stone lithiasis, possibly associated with a degree of stricture formation. At operation it was not possible to clear the ductal system from below. Resection of the left lateral segment (Couinaud segments 2 and 3) was accomplished easily at very little risk and achieved several goals. It removed the bulk of the stones and the damaged portion of the liver and the probable site of stone formation. It provided excellent access to the ductal system of the left medial segment from above and below. The choledochojejunostomy with percutaneous access was precautionary, and the patient was maintained on a nighttime dose of ursodeoxycholic acid, 250 mg/d.

This is the second case of multiple intrahepatic stones in which the clinical course, biochemical composition and treatment is described in detail. Strichartz and associates[10] recently presented a case in which sequential biliary biochemical analyses were performed after surgical treatment complemented with oral dissolution agents. Chenotherapy decreased the cholesterol saturation index from hepatic bile, probably preventing further stone formation. These two cases are remarkably similar. Another recent report from Japan documented multiple cholesterol stones in one patient at autopsy in association with cholangiocarcinoma.[12] Saito and colleagues[11] reported three cases treated by resection; the method of chemical analysis and the outcome of treatment were not stated.

The diagnosis of multiple intrahepatic cholesterol gallstones should be considered especially when multiple intrahepatic stones are seen in occidentals and when the usual history of repeated bouts of cholangitis are absent. Obtaining a stone at endoscopic retrograde cholangiopancreatography would

allow assay of cholesterol content of the stone and make the diagnosis. It is even possible that the disease might be amenable to ursotherapy.

Intrahepatic stones can be found in as many as 24% of patients with choledocholithiasis.[4] The incidence of intrahepatic stones has not changed significantly through the last century although there is a declining trend in the most recent reports (Table I[2-4,6-8,20-28]). We have calculated that about 5% of symptomatic patients with gallstones have intrahepatic calculi, although the incidence of primary and multiple cholesterol intrahepatic stones is not known. There are a number of reports of intrahepatic stones treated by liver resection with low death rates and reduced complications during the follow-up (Table II[2,8,9,27-31]).

Conclusions

Intrahepatic cholesterol lithiasis is rare but may be recognized preoperatively. Treatment depends on the presence of complications and the distribution of the stones.

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Table I. Intrahepatic Calculi Disease Reported in Western and Oriental Countries

Series	Year	Country	Patients, no.	Condition/ procedure	Liver stones, no. (%)	Corrected percent†
Thudichum*	1863	Germany	NM	NM	NM (5.0)	5.0
Schroeder*	1892	Germany	NM	NM	NM (9.0)	9.0
Beer*	1904	Germany	72	Cholelithiasis	6 (8.3)	8.3
Miyake*	1913	Japan	257	Cholelithiasis	20 (7.8)	7.7
Hansen*	1926	Norway	97	Cholelithiasis	7 (7.2)	7.2
Best[20]	1944	USA	456	Cholelithiasis	35 (7.6)	7.6
Chih-Chi'iang[21]	1959	China	NM	Primary bile duct stones	110 (30.0)	
Glenn and Moody[22]	1961	USA	169	Common bile duct explorations	22 (13.0)	2.6
Bove et al[23]	1963	Brazil	2 000	Biliary disease	20 (1.0)	1.0
Shore and Berci[4]	1970	USA	123	Common bile duct explorations	30 (2.4)	4.8
King[24]	1971	Malaysia	661	Biliary disease	120 (18.1)	18.1
Balasegaram[25]	1972	Malaysia	NM	NM	68 (10.2)	10.2
Maki et al[8]	1972	Japan	670	Cholelithiasis	46 (6.9)	6.8
Lindstrom[3]	1977	Sweden	804	Necropsies (gallstone)	5 (0.6)	3.1
Simi et al[2]	1979	Italy	2 700	Surgery gallstone	36 (1.3)	1.3
Nagase et al[26]	1980	Japan	3 493	First biliary tract surgery	106 (3.0)	3.0
Sato et al[27]	1980	Japan	1 452	Biliary tract surgery	100 (6.9)	6.9
Nakayama and Koga[6]	1984	Japan	38 604	Cholelithiasis	1590 (4.1)	4.1
Nakayama and Koga[6]	1984	Korea	NM	Cholelithiasis	NM (17.0)	17.0
Nakayama and Koga[6]	1984	China	NM	Cholelithiasis	NM (38.0)	38.0
Nakayama and Koga[6]	1984	Taiwan	318	Cholelithiasis	170 (53.5)	53.4
Chen et al[28]	1984	China	362	Cholelithiasis	162 (44.8)	44.7
Nakayama and Koga[6]	1984	Singapore	647	Cholelithiasis	11 (1.7)	1.7
Nakayama and Koga[6]	1984	Hong Kong	700	Cholelithiasis	22 (3.1)	3.1
Nakayama et al[7]	1986	Japan	671	Cholelithiasis	31 (4.6)	4.6

NM = not mentioned
*Cited by Best[20]
†Some numbers have been corrected in order to make comparable, as far as possible, the different reports. For this purpose we assume that 20% of patients with gallstones are symptomatic and undergo surgery, with 20% of them having common bile duct exploration.

Table II. Reported Outcomes After Liver Resection for Intrahepatic Stones

Author	Year	Country	Liver resections, no.	Deaths, no. (%)	Follow-up
Wen and Lee[9]	1972	China	150	7 (4.5)	NM
Maki et al[8]	1972	Japan	8	3 (37.5)	1 no rehabilitation
Simi et al[2]	1979	Italy	36	0	3 recurrences
Sato et al[27]	1980	Japan	100	10 (10.0)	8 low rehabilitations
Adson and Nagorney[29]	1982	USA	9	0	NM
Chang and Passaro[30]	1983	Taiwan	201	2 (1.0)	NM
Chen et al[28]	1984	China	162	17 (10.5)	NM
Choi and Wong[31]	1986	Hong Kong	209	2 (1.0)	37 recurrences

NM = not mentioned

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NOTICES
AVIS

Fourth Annual Rush Symposium on Transplantation

"Broaching the Biological Barriers to Transplantation" will be the topic of the Fourth Annual Rush Symposium on Transplantation. The symposium will be held at Rush-Presbyterian-St. Lukes's Medical Center in Chicago on June 26, 1993. Specific attention will be given to the features of immune function that offer a common barrier to the successful transplantation of both solid organs and bone marrow. The registration fee is $150 US. To register for the symposium or for more information contact: The Transplant Program Physician Relations Coordinator at (312) 942–6242.

GI Tract Laparoscopic Surgery International Meeting

The third international meeting on gastrointestinal tract laparoscopic surgery will be held in Liège, Belgium, on Sept. 9 and 10, 1993. The morning sessions will feature operative demonstrations. The afternoons sessions will concentrate on two themes: the presentation of the most recent techniques and the evolution of surgical techniques in well-tried operations. Each speaker will present his or her own experience and initial and latest results. For more information contact: Catherine Marissaux, Clinique Saint-Joseph, rue de Hesbaye 75, B–400, Liege, Belgium.

Cutaneous Malignancies: 1994 Skin Cancer Update

This course, designed for physicians with an interest in skin cancers, will take place from Jan. 21 to 23, 1994, at the Sheraton Grande Torrey Pines Hotel in La Jolla, Calif. Sponsored by Scripps Clinic and Research Foundation, the course is designed for dermatologists, oculoplastic surgeons, ophthalmologists, head and neck surgeons, plastic surgeons and other physicians with an interest in skin cancers. The course will provide an update on cutaneous neoplasms, melanoma and facial

continued on page 275

Value of Cultures of Tissue Samples Taken at Operation for Lower Intestinal Perforation

Frankie O.G. Fraulin, MD; Olin G. Thurston, MD, FACS, FRCSC

Tissue cultures from perforations of the lower intestinal tract commonly yield both aerobes (coliform organisms) and anaerobes (*Bacteroides* sp. and *Clostridium* sp.). To determine the consistency of this pattern and the value of intraoperative cultures, the authors reviewed the hospital records of 115 patients with perforation of the appendix (100 patients) or colon (15 patients), treated between 1987 and 1990, in whom organisms were cultured from tissue samples taken intraoperatively. Attention was paid to the organisms cultured, their distribution and antibiotic sensitivity in initial samples and in subsequent samples obtained when there were septic complications.

On average, 4.7 bacterial isolates per patient were obtained. The common organisms were as expected: *Bacteroides fragilis, Escherichia coli* and *Clostridium* sp. Although the culture results did not affect the management of these patients, the sensitivity of *Bacteroides fragilis* to cefoxitin was found to be lower than expected, indicating a shift in sensitivity.

Les cultures des tissus adjacents à une perforation des voies intestinales inférieures révèlent généralement la présence d'aérobies (des coliformes) et d'anaérobies (*Bacteroides* sp. et *Clostridium* sp.). Afin de vérifier la constance de cette observation et l'utilité des prélèvements effectués en cours de chirurgie pour fins de culture, les auteurs ont étudié les dossiers de 115 patients souffrant d'une perforation de l'appendice (100 patients) ou du côlon (15 patients) qui furent traités entre 1987 et 1990, et dont des microorganismes furent cultivés à partir des échantillons tissulaires prélevés durant la chirurgie. On a recherché les types d'organismes isolés, leur distribution, leur sensibilité initiale aux antibiotiques et celle qu'ils exhibèrent subséquemment lorsqu'il y eut des complications infectieuses.

Une moyenne de 4,7 isolats bactériens furent obtenus par patient. Les microorganismes les plus fréquents furent ceux auxquels on s'attendait: *Bacteroides fragilis, Escherichia coli* et *Clostridium* sp. Bien que les cultures bactériennes n'aient pas influencé le traitement des patients, la sensibilité du *Bacteroides fragilis* à la céfoxitine s'est avérée plus faible qu'anticipé, ce qui indique un déplacement de la sensibilité de ce microorganisme.

The bacteria encountered in perforations of the lower intestinal tract have been well characterized; they represent a mixture of the normal aerobic and anaerobic enteric flora.[1,2] For example, the most common groups isolated include coliforms or gram-negative aerobes (e.g., *Escherichia coli*), gram-negative anaerobes (e.g., *Bacteroides fragilis*), gram-positive anaerobes (e.g., *Peptostreptococcus* and *Clostridium* sp.) and, less commonly, gram-positive aerobes (e.g., α-hemolytic *Streptococcus*).

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Accepted for publication June 19, 1992

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In practice, when a patient is operated on for bowel perforation, it is almost routine for samples of peritoneal fluid to be taken for culture; and it is often taken for granted that the results will influence the choice of antibiotics to be given postoperatively. Furthermore, many studies[3-6] have compared various combinations of antibiotics in the treatment of appendiceal perforations. The common conclusion from these studies is that the patient requires broad-spectrum antibiotics to cover both the aerobic and anaerobic flora.[3-6] Therefore, if we know that polymicrobial organisms will be cultured and that the antibiotics needed to treat them must be broad spectrum, we must question the value of tissue culture in the first place.

To determine if there is any need for tissue culture at operation in cases of perforation of the lower intestinal tract, we set out to answer two questions: (a) Does culture of peritoneal fluid obtained at operation ever yield organisms other than the ones expected? and (b) Do the results of these cultures actually influence patient management postoperatively?

Method

We reviewed the hospital records of 115 patients (70 males, 45 females), treated between July 1987 and April 1990 at the Walter C. Mackenzie Health Sciences Centre, University of Alberta, who met the following criteria: (a) had perforation of the appendix (100 patients) or colon (15 patients); (b) had samples of peritoneal fluid taken intraoperatively for culture; and (c) had positive culture results, and the organisms were identified.

The hospital courses of these patients were reviewed with particular attention to the organisms cultured, their antibiotic sensitivity, the antibiotics chosen and the septic complications. In our hospital, aerobic cultures are taken with cotton swabs (Starswab; Starplex Scientific, Etobicoke, Ont.); anaerobic cultures are taken with cotton swabs and transported in anaerobic culture media (Port-a-cul tube; Beckon Dickinson Microbiology Systems, Cockeysville, Md.). Antibiotic sensitivities were not reported for all organisms cultured; if sensitivities were measured, they were reported as sensitive, moderately sensitive, or resistant.

Results

Epidemiologic Findings

The patients ranged in age from 8 months to 88 years (mean 38 years). On average 4.7 different species of bacteria, both aerobes and anaerobes, were isolated per patient from the cultures. Tissue cultures yielded aerobic and anaerobic organisms in 99 of the 115 patients (86%), aerobes only in 12 (10%) and anaerobes only in 4 (3%).

Table I. Type of Aerobes Isolated and Number of Isolates

Organism	No. of isolates
Escherichia coli	85
α-hemolytic *Streptococcus*	32
Pseudomonas sp	15
Klebsiella sp	12
Eikenella corrodens	10
Group D *Streptococcus*	8
β-hemolytic *Streptococcus* (not group A, B, C or G)	8
Group C β-hemolytic *Streptococcus*	6
Group F β-hemolytic *Streptococcus*	5
Staphylococcus epidermidis	5
Diphtheroids	3
Haemophilus sp	3
Proteus sp	2
Citrobacter sp	2
Salmonella sp	2
Streptococcus pneumoniae	1
Corynebacterium sp	1
Enterobacter cloacae	1
Morganella morganii	1
Gram-positive cocci, not specified	8
Gram-negative bacilli, not specified	5
Total	215

Organisms Cultured

Out of a total of 537 bacterial isolates, 215 (40%) were aerobes and 321 (60%) were anaerobes; 1 was a yeast. The commonest organisms isolated were the ones we expected to find (Tables I and II).

For aerobes, *E. coli* predominated (85 isolates), followed by α-hemolytic *Streptococcus* (32 isolates) and *Pseudomonas* sp. (15 isolates). For anaerobes, *Bacteroides* sp. (108 isolates) predominated (the most common being *Bacteroides fragilis*), followed by *Clostridium* sp. (54 isolates) and *Peptostreptococcus* sp. (31 isolates).

Bacterial Sensitivity

For 92 (80%) of the 115 cultures, antibiotic sensitivities were reported, most commonly for *Bacteroides* sp. and *E. coli*.

For the 108 *Bacteroides* isolates,

Table II. Type of Anaerobes Isolated and Number of Isolates

Organism	No. of isolates
Bacteroides fragilis	61
Bacteroides sp	47
Clostridium sp	54
Peptostreptococcus sp	31
Eubacterium lentum	19
Microaerophilic *Streptococcus*	16
Fusobacterium sp	12
Veillonella sp	2
Lactobacillus sp	2
Gram-positive cocci, not specified	23
Gram-positive bacilli, non-spore forming, not specified	39
Gram-negative bacilli, not specified	15
Total	321

74 (69%) had antibiotic sensitivities reported; 20 (27%) of these isolates were resistant, and 21 (28%) were only moderately sensitive to cefoxitin. All were sensitive to metronidazole.

For the 85 *E. coli* isolates, 77 (91%) had antibiotic sensitivities reported; 19 (25%) were resistant and 22 (29%) were only moderately sensitive to ampicillin. One isolate was resistant to gentamicin.

Patient Management

All but two patients received antibiotics preoperatively, and all patients received them postoperatively. The average length of antibiotic therapy for patients with appendiceal perforation was 6.6 days, compared with 19.5 days for patients with colonic perforations.

Culture results appeared to influence the addition or deletion of antibiotics in only eight patients (7%). For example, if a patient was given cefoxitin postoperatively and the culture grew *Bacteroides* sp. resistant to cefoxitin, therapy would appear to have been influenced by the culture results only if a change in antibiotics was made.

In contrast, culture results did not appear to influence therapy in 107 (93%) patients. The majority of these (61 patients [57%]) were placed on "triple" antibiotic therapy postoperatively, consisting of metronidazole, gentamicin and either penicillin or ampicillin, and no adjustment was made in the antibiotics despite the culture results. (Other frequent combinations included cefoxitin and metronidazole or cefoxitin alone.)

Antibiotics and Antibiotic Sensitivity

We also compared the relationship of the antibiotics the patient was receiving with the antibiotic sensitivity of the organisms in culture. If a patient was receiving antibiotics that covered the organisms cultured according to the sensitivity data, the situation was considered "ideal" (64 patients). If the antibiotic therapy and sensitivity data did not coincide, the situation was considered "non-ideal" (16 patients) (Because of a lack of sensitivity data or because the sensitivities given were not to any antibiotics the patient was receiving, 35 patients were excluded from these two groups.) Patients in the "non-ideal" group would be expected to have a higher complication rate because they were receiving inappropriate treatment. However, we found no difference in the septic complication rate between the two groups. Thirteen (20%) of the "ideal" cases had septic complications compared with 3 (19%) of the "non-ideal" cases.

Septic Complications

Twenty-two patients suffered septic complications related to the original perforation. These complications can be categorized as follows: wound infection (10); intra-abdominal abscess (4); wound dehiscence (2); septic shock (2); pulmonary infection (2); perforation at another intestinal site (1); and thrush (1). Four of these patients died (one patient with wound dehiscence, both patients with septic shock and one patient with pulmonary infection).

Of those who had an original diagnosis of perforated appendix, 14% had septic complications. Of those who had an original diagnosis of perforated colon, 53% had septic complications.

Samples of tissue were taken from the complication site for culture in 18 of the 22 patients. The most common organisms cultured were again representative of the normal enteric flora. Again, the culture results did not appear to have influenced therapy. The majority of these patients were placed on triple antibiotic therapy or imipenem.

Discussion

In answer to the first of the two questions we posed — Does culture of peritoneal fluid obtained at operation for perforation of the lower intestinal tract ever yield organisms other than the ones expected? — we found that the organisms cultured were predictable in samples obtained at the first operation and in subsequent complications and were usually a combination of aerobic and anaerobic organisms.

The relationship between aerobes and anaerobes in intra-abdominal infection has been shown to be synergistic in animal models.[7,8] Brook, in 1980[1] and 1989[2], described the variety of possible organisms cultured. He found *B. fragilis, E. coli* and *Peptostreptococcus* to be the predominant pathogens. Our results contrast only in that *Clostridium* sp. was the third most common isolate, closely followed by *Peptostreptococcus* and α-hemolytic *Streptococcus.*

We did not find any unusual organisms. We had only one yeast isolate, which bore no relation to the severity of illness or subsequent complications. In a recent study of tissue samples taken at operation for perforation of the upper intestinal tract, several isolates of yeast were cultured and were associated with an increased septic complication rate and mortality.[9] Three patients in our study had chronic renal failure but the organisms cultured were not unusual. None of our patients had acquired immunodeficiency syndrome (AIDS).

There have been infrequent re-

ports of unusual organisms cultured; *Salmonella newport* and *Shigella flexneri* have both been associated with toxic megacolon and colonic perforation.[10,11] A toothpick perforation of the sigmoid colon associated with *Erysipelothrix rhusiopathiae* septicemia has been reported.[12] A patient with AIDS who had colonic perforation and cytomegalovirus vasculitis has also been reported.[13]

Unusual organisms often require special culture media to grow, which may explain why certain organisms were not cultured. More important, in terms of virulence and frequency, are the anaerobes and the difficulty in culturing them. Improper collection techniques and prolonged exposure to oxygen can decrease the number of strains isolated.[14] It has also been suggested that the number and variety of organisms cultured depend on preoperative antibiotic therapy.[2,15]

In answer to the second question we posed — Do the results of these cultures actually influence patient management postoperatively? — we found that cultures and antibiotic sensitivity data added little to the management of these patients. Culture results influenced antibiotic therapy in only 7% of patients after the initial operation and in none of the patients who had septic complications.

Dougherty and associates[16] reported a similar percentage in their review of bacterial cultures in perforated or gangrenous appendicitis. They also tried to identify predictors of culture influence on antibiotic management. The three most important predictors, according to Dougherty and associates, were the occurrence of infectious complications postoperatively, isolation of organisms resistant in vitro to previous antibiotic therapy and prolonged courses of antibiotics. However, because of the low number of patients whose culture results actually influenced management (7 of 104 patients), the value of these predictors is questionable.

As already mentioned, most patients in our study received triple-antibiotic therapy postoperatively. However, some were placed on cefoxitin alone. We found that *Bacteroides* sp. were more resistant than expected (27%) and had only moderate sensitivity (28%) to cefoxitin in in-vitro culture. These figures agree with the low sensitivity rate of *B. fragilis* to cefoxitin (only 50%) reported by the Department of Medical Microbiology at the University of Alberta Hospitals in their January to June 1991 antibiogram.[17] A nationwide study done in the United States in the early 1980s also showed increasing resistance of this organism to cefoxitin, although to a lesser degree at that time (10% resistance in 1982, 16% resistance in 1983).[18] Both in our hospital and in the United States study, there has been 100% sensitivity of *B. fragilis* to metronidazole and chloramphenicol. The authors of the United States study suggested that the reasons for increased resistance may be epidemiologic factors that result in a decrease in the permeability of the outer membrane or an increase in the β-lactamase content. Changing sensitivity rates is a good indication for continued monitoring to detect the emergence of outbreaks due to resistant organisms.

Conclusions

We found that routine bacterial cultures were not useful in the clinical management of patients with perforations of the lower intestinal tract. However, the cultures were of some "value" in that they showed a lower than expected sensitivity of *Bacteroides* sp. to cefoxitin. This has resulted in a decreased use of cefoxitin by the general surgeons in our hospital and an increased use of metronidazole.

The value of routine cultures of tissue samples obtained intraoperatively in perforations of the lower intestinal tract must be questioned, except in regard to detection of long-term shifts in antibiotic sensitivity.

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BOOK REVIEWS

continued from page 207

Francisco and the University of Queensland, this beautifully illustrated atlas covers the whole range of vascular complications.

The book has a number of shortcomings. The chapters on imaging techniques are good but contain little discussion of graft surveillance. No mention is made of cost effectiveness, the frequency of graft failure and time elapsed before graft failure occurs. The use of magnetic resonance imaging in diagnosing infected grafts is also dealt with briefly. Discussion of the relative merits of arteriography, including intravenous and intra-arterial digital subtraction angiography, which is invaluable in defining specific problems, would have been helpful. The use of vein grafts after failed autogenous renal reconstruction or visceral reconstruction is dismissed without discussion.

The chapter on failed vein grafts makes no mention of the use of duplex scanning and whether this procedure is more helpful than measurement of the ankle–brachial pressure. No reference is made to the use of thrombolytic therapy as an adjunct before surgical intervention. In the chapter on graft-limb thrombosis, crossover femoral bypass and profundaplasty are not mentioned as alternative forms of management. Furthermore, discussion of alternatives to some of the reoperative procedures described would have strengthened the book. The addition of references would have been helpful.

Despite these shortcomings, this is an excellent atlas. It is clearly laid out and contains superb illustrations. I would recommend it to any resident in vascular surgery or vascular surgeon as a useful addition to their library.

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DIAGNOSIS OF COLORECTAL AND OVARIAN CARCINOMA. APPLICATION OF IMMUNOSCINTIGRAPHIC TECHNOLOGY (TARGETED DIAGNOSIS AND THERAPY SERIES/6). Edited by Robert T. MacGuire and Douglas Van Nostrand. 260 pp. Illust. Marcel Dekker, Inc., New York. 1992. $99.75 (US). ISBN 0-8247-8648-7

This multiauthored book summarizes the experience of several institutions with a labelled monoclonal antibody (MAb) B72.3 (also known as CYT-103-111 In or OncoScint), which is reactive against an antigen frequently found in adenocarcinomas.

This book is the sixth in a series published under the auspices of the Cytogen Corp., the manufacturer of this MAb kit for radiolabelling. One of the editors, R.T. MacGuire, is the director of clinical investigations at Cytogen. I approached this text with scepticism, fearing that it would be a self-serving product monograph, but I found it to be objective and to have broad application.

The authors document the difficulties encountered in radioimmunoimaging as well as the benefits from the use of this product. MAb B72.3 is only one of an almost limitless number of potential MAbs that might be introduced for clinical trials. This particular product appears to complement other diagnostic modalities for the staging of metastatic disease. It was able to demonstrate additional focal or diffuse lesions that were not detectable by computed tomography or ultrasonography. False-positive results were not common but were seen in inflammatory lesions and in some uninvolved lymph nodes draining the primary site. The MAb was not particularly sensitive for primary colonic carcinomas and is thus not useful for initial diagnosis. There are sufficient data in this volume and in the extensive references for the reader to decide whether this product has a potential use in a given clinical practice.

Aside from the specifics of MAb, readers with an interest in the use of labelled MAbs for research, clinical diagnosis or possible therapy will find a considerable amount of useful general information for any MAb application. This includes an overview of radioimmunoimaging, a review of the methodology for production and labelling of MAbs, immunopharmokinetics and future directions for improvement in MAb production and imaging.

continued on page 270

PrVASOTEC®

(enalapril maleate, Frosst Std.)

Tablets 2.5, 5, 10, 20 mg

PrVASOTEC® I.V.

(enalaprilat)

1.25 mg/mL

Angiotensin Converting Enzyme Inhibitor

INDICATIONS AND CLINICAL USE

VASOTEC® is indicated in the treatment of essential or renovascular hypertension; usually administered in association with other drugs, particularly thiazide diuretics. Consider the risk of angioedema (see WARNINGS). Normally used when a diuretic or beta-blocker was ineffective or associated with unacceptable adverse effects. Can also be tried as initial agent where a diuretic and/or beta-blocker is contraindicated or could cause serious adverse effects.

Oral enalapril is also indicated in the treatment of congestive heart failure, as adjunctive therapy in patients not responding adequately to digitalis and diuretics.

Use of ACE inhibitors during the second and third trimesters of pregnancy can cause injury or death of a developing fetus. When pregnancy is detected, discontinue VASOTEC® as soon as possible (see WARNINGS; Use in Pregnancy).

VASOTEC® I.V. (enalaprilat) is an active metabolite of enalapril; the onset of action after administration occurs within 15 minutes, with the maximum effect within 1 to 4 hours.

VASOTEC® I.V. is indicated for the treatment of hypertension when oral therapy is not practical. VASOTEC® I.V. has been studied with only one other antihypertensive agent, furosemide, which showed additive effects on blood pressure. Due to insufficient experience in the treatment of accelerated or malignant hypertension, VASOTEC® I.V. is not recommended in such situations (see DOSAGE and ADMINISTRATION).

CONTRAINDICATIONS

Hypersensitivity to any component; history of angioneurotic edema related to ACE inhibitor therapy.

WARNINGS

Angioedema, with laryngeal edema and/or shock, have been reported and may be fatal. In such cases, discontinue drug promptly and observe patient until swelling subsides. Swelling confined to the face, lips, and mouth usually resolves without treatment, although antihistamines may be useful in relieving symptoms. However, where there is involvement of the tongue, glottis and larynx, likely to cause airway obstruction, prompt administration of subcutaneous adrenaline (0.5 mL 1:1000) may be indicated. Patients with a history of angioedema, unrelated to ACE inhibitor use, may be at increased risk (see CONTRAINDICATIONS).

Symptomatic hypotension has occurred, usually during initial therapy or when the dose was increased, and is more likely in patients who are volume-depleted. In patients with severe congestive heart failure, excessive hypotension may be associated with oliguria and/or progressive azotemia. For patients in whom the excessive hypotension could result in severe or fatal complications, i.e. those with severe congestive heart failure, ischemic heart or cerebrovascular disease – start therapy under close medical supervision, usually in a hospital. Such patients should be followed closely for the potential fall in blood pressure during first two weeks of therapy or when enalapril or a diuretic is increased. If hypotension occurs, place patient in supine position and if needed, administer IV infusion of normal saline. A transient hypotensive response is not a contraindication to further doses of enalapril or enalaprilat.

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Neutropenia/agranulocytosis and bone marrow depression have been caused by ACE inhibitors. Current experience with enalapril shows incidence to be rare. Consider periodic monitoring of white blood cell counts in patients with collagen vascular disease and renal disease.

Use of ACE inhibitors in pregnancy can cause fetal and neonatal morbidity and mortality. When pregnancy is detected, discontinue VASOTEC® as soon as possible. Rarely, no alternatives to an ACE inhibitor will be found and mothers should be apprised to the potential hazards to the fetus. Ultrasound should be performed to assess fetal development, well-being and volume of amniotic fluid. If oligohydramnios is observed, discontinue VASOTEC® unless lifesaving for the mother. A non-stress test and/or a biophysical profiling may be appropriate however, if concerns persist, a contraction stress testing should be considered. Oligohydramnios may only appear after fetus has sustained irreversible injury.

Closely observe infants exposed *in utero* to ACE inhibitors for hypotension, oliguria and hyperkalemia, and initiate appropriate corrective medical procedures.

Human Data: Exposure to ACE inhibitors during second and third trimesters has been associated with hypotension, neonatal skull hypoplasia, anuria, reversible or irreversible renal failure and death of the fetus. Oligohydramnios, associated with fetal limb contractures, craniofacial deformation, and hypoplastic lung development also has been reported. Prematurity and patent ductus arteriosus also reported but unknown if due to ACE inhibitor use. It is not known whether exposure limited to the first trimester can adversely affect fetal outcome.

PRECAUTIONS

Impaired renal function: Renal function should be assessed before initiating therapy with enalapril or enalaprilat. Patients with renal insufficiency may require reduced or less frequent doses, and their renal function must be monitored appropriately (see DOSAGE). Renal failure, which has been reported mainly in patients with severe congestive heart failure or underlying renal disease including renal artery stenosis, is usually reversible when treated promptly.

Some hypertensive patients with no apparent renal disease have developed increases in BUN and creatinine while on concurrent diuretic/enalapril therapy. Dosage reduction or discontinuation of one or both drugs may be required.

Hyperkalemia: In clinical trials, hyperkalemia (>5.7 mmol/L) was observed in approximately 1% of hypertensive patients, and caused discontinuation of therapy in 0.28% of such patients. Risk factors for hyperkalemia development may include renal insufficiency, diabetes mellitus, and concomitant use of agents to treat hypokalemia (see ADVERSE REACTIONS).

Valvular Stenosis: Theoretically, patients with aortic stenosis, who do not develop as much afterload reduction, might be at risk of decreased coronary perfusion when treated with vasodilators.

Surgery/Anaesthesia: During major surgery or anaesthesia with hypotensive agents, enalapril blocks angiotensin II formation secondary to compensatory renin release. Hypotension that develops due to this mechanism can be corrected by volume expansion.

Impaired liver function: Hepatitis, jaundice (hepatocellular and/or cholestatic),elevation of liver enzymes and/or serum bilirubin, which have occurred in patients with or without pre-existing liver abnormalities, were usually reversed on discontinuation of enalapril or enalaprilat. For any unexplained symptoms, particularly within the first months of treatment, a full set of liver function tests and other necessary investigations are recommended. Consider discontinuation of enalapril or enalaprilat when appropriate. Use enalapril or enalaprilat with particular caution in patients with pre-existing liver abnormalities. Obtain baseline liver function tests before initiating drug and monitor response and metabolic effects closely.

Cough: A dry, persistent cough has been reported, which usually disappears after withdrawal or lowering the dose of enalapril or enalaprilat.

Nursing mothers: Enalapril and enalaprilat are secreted in human milk in trace amounts therefore, nursing should be interrupted.

Pediatric use: This use is not recommended because enalapril and enalaprilat have not been studied in children.

Hemodialysis patients: Anaphylactoid reactions have been reported with high-flux membranes (eg. polyacrylonitrile [PAN]) and treated concomitantly with an ACE inhibitor. If symptoms such as nausea, abdominal cramps, burning, angioedema, shortness of breath and severe hypotension occur, stop dialysis immediately. The symptoms are not relieved by antihistamines and the use of a different type of dialysis membrane or class of antihypertensive agent should be considered.

Drug Interactions

Hypotension - Patients on Diuretic Therapy: Particularly when diuretics recently initiated, patients occasionally experience hypotension after initiating therapy with enalapril or enalaprilat. To minimize the hypotensive effects, discontinue the diuretic or increase the salt intake prior to starting the drug. If the diuretic cannot be discontinued, patients should be placed under close medical supervision for at least one hour after the initial dose of enalaprilat (see WARNINGS).

Agents Increasing Serum Potassium: Since enalapril and enalaprilat decrease aldosterone production, elevation of serum potassium may occur. Diuretics such as spironolactone, triamterene or amiloride, or potassium supplements should be given cautiously for documented hypokalemia only and should be monitored frequently. Potassium containing salt substitutes should be used with caution.

Agents Causing Renin Release: Diuretics, for example, augment the antihypertensive effect of enalapril and enalaprilat.

Agents Affecting Sympathetic Activity: Ganglionic blocking agents or adrenergic neuron blocking agents, for example, may be used with caution. Beta-adrenergic blockers add some further antihypertensive effect to enalapril.

Lithium Salts: Lithium clearance may be reduced; therefore, monitor serum lithium levels carefully if they are administered.

ADVERSE REACTIONS

VASOTEC®: In controlled clinical trials involving 2314 hypertensive patients and 363 heart failure patients, the most severe adverse reactions were: angioedema (0.2%), hypotension (2.3%) and renal failure (5 cases). In hypertensive patients, hypotension occurred in 0.9% and syncope in 0.5%, with a discontinuation rate of 0.1%. In heart failure patients, hypotension occurred in 4.4% and syncope in 0.8%, with a discontinuation rate of 2.5%. The most frequent clinical adverse reactions in controlled clinical trials were: headache (4.8%), dizziness (4.6%) and fatigue (2.8%). Discontinuation of therapy was required in 6.0% of the 2677 patients.

	Hypertension % (2314 Patients)	Heart Failure % (363 Patients)
CARDIOVASCULAR		
Hypotension	0.9	4.4
Chest Pain	0.9	1.7
Palpitations	0.6	0.3
Myocardial Infarction, Acute	0.2	0.6
Myocardial Infarction, Recurrent	—	0.3
GASTROINTESTINAL		
Nausea	1.4	1.1
Vomiting	0.8	1.7
Dysphagia	0.1	—
Diarrhea	1.4	3.0
Abdominal pain	0.7	1.4
RENAL		
Renal failure	0.1	0.6
Oliguria	1 case	—
Proteinuria†	0.1	—
DERMATOLOGIC		
Rash	1.4	1.9
Pruritus	0.4	1.4
NERVOUS SYSTEM		
Headache	5.2	2.2
Dizziness	4.3	6.6
Insomnia	0.5	0.3
Nervousness	0.6	—
Somnolence	0.6	—
Paresthesia	0.6	—
ALLERGIC		
Cough	1.3	1.4
Angioedema	0.2	—
HEMATOLOGIC		
Anemia	0.1	—
Leukopenia	1 case	—
MISCELLANEOUS		
Muscle cramps	0.6	0.3
Dyspnea	0.6	1.1
Hyperhidrosis	0.7	—
Impotence	0.4	0.3
Fatigue	3.0	1.4
Taste disturbance	0.4	0.3

† Defined as >1 g/24h or >0.5 g/12h on two consecutive measurements, at least one month apart.

ABNORMAL LABORATORY FINDINGS

Hyperkalemia: (see PRECAUTIONS).

Creatinine, Blood Urea Nitrogen: Increases were reported in about 20% of patients with renovascular hypertension and about 0.2% of patients with essential hypertension on enalapril alone. Increases, which usually were reversible upon discontinuation of enalapril or concomitant therapy, were reported in 9.7% of heart failure patients who were receiving diuretics and/or digitalis.

Hemoglobin and Hematocrit: Decreases (mean approximately 0.34 g% and 1.0 vol%, respectively) occurred frequently, but were rarely of clinical importance. In clinical trials, less than 0.1% of patients discontinued therapy due to anemia.

Hepatic: Elevations of liver enzymes and/or serum bilirubin have occurred (see PRECAUTIONS).

ADVERSE REACTIONS REPORTED IN UNCONTROLLED TRIALS AND/OR MARKETING EXPERIENCE

With an incidence of 0.5 to 1%: Insomnia, impotence, renal dysfunction, renal failure and oliguria.

With an incidence < 0.5%:

Cardiovascular: Myocardial infarction or cerebrovascular accident, possibly secondary to excessive hypotension in high risk patients (see WARNINGS); cardiac arrest; pulmonary embolism; rhythm disturbances; angina pectoris. **Gastrointestinal:** Anorexia; ileus; pancreatitis; dyspepsia; constipation. **Hemopoeitic:** Neutropenia; thrombocytopenia; bone marrow depression. **Hepatic:** Liver function abnormalities; hepatitis; jaundice (hepatocellular and/or cholestatic). **Nervous System/Psychiatric:** Vertigo; depression; confusion; ataxia. **Respiratory:** Bronchospasm/asthma; rhinorrhea. **Other:** Erythema multiforme; exfoliative dermatitis; Stevens-Johnson syndrome; toxic epidermal necrosis; urticaria; photosensitivity; alopecia; flushing; tinnitus; hearing impairment; glossitis; blurred vision. A symptom complex has been reported which may include fever, serositis, vasculitis, myalgia, arthralgia/arthritis, a positive ANA, elevated erythrocyte sedimentation rate, eosinophilia and leukocytosis. Rash, photosensitivity or other dermatologic manifestations may occur. These symptoms have disappeared after discontinuation of therapy.

LABORATORY TEST FINDINGS: Hyponatremia

VASOTEC® I.V.: Since enalapril is converted to enalaprilat, those adverse reactions associated with VASOTEC® tablets might also be expected to occur with VASOTEC® I.V. The incidence of symptomatic hypotension is 3.4% with VASOTEC® I.V. Other adverse experiences occurring in greater than 1% of patients were headache (2.9%) and nausea (1.1%). Adverse reactions occurring in 0.5 to 1.0% of patients in controlled clinical trials include myocardial infarct, fatigue, dizziness, fever, rash and constipation.

SYMPTOMS AND TREATMENT OF OVERDOSAGE

Limited human data are available. The most likely manifestation of overdosage would be hypotension, which can be treated by I.V. infusion of normal saline solution. Enalaprilat may be removed from the general circulation by hemodialysis.

DOSAGE AND ADMINISTRATION

VASOTEC®
FOR ORAL ADMINISTRATION ONLY

Dosage must be individualized. The absorption of enalapril maleate is not affected by food.

HYPERTENSION

Initiation of enalapril requires consideration of extent of blood pressure elevation, salt restriction and recently used antihypertensive agents, the dosage of which may need to be adjusted.

The recommended initial dose of enalapril maleate in patients not on diuretics is 5 mg once a day. Adjust dosage according to blood pressure response; the usual range is 10 to 40 mg daily, in a single dose or divided in two doses. Some patients on once-daily dosage may have diminished antihypertensive effect toward the end of dosing interval and require an increase in dosage, or twice daily administration. If blood pressure is not controlled, a diuretic may be added. Raising the daily dose above 40 mg is not recommended because adverse reactions may be increased.

Occasionally symptomatic hypotension may occur following the initial dose, more likely in patients currently taking a diuretic. Therefore, if possible, discontinue the diuretic two to three days before initiating enalapril therapy (see WARNINGS). If the diuretic cannot be discontinued, use an initial dose of 2.5 mg.

In the absence of sufficient experience in the treatment of accelerated or malignant hypertension, enalapril is not recommended in such situations.

Dosage in the Elderly (over 65 years): Start at 2.5 mg daily. Some elderly patients may be more responsive than younger patients.

Dosage Adjustment in Renal Impairment: (see PRECAUTIONS - Hemodialysis patients)

Guidelines for reducing doses in hypertensive patients:

Renal Status	Creatinine Clearance mL/min(mL/s)	Initial Dose mg/day
Normal renal function	> 80 mL/min (>1.33 mL/s)	5 mg
Mild impairment	≤ 80 > 30 mL/min (≤ 1.33 > 0.50 mL/s)	5 mg
Moderate to severe impairment	≤ 30 mL/min (≤ 0.50 mL/s)	2.5 mg
Dialysis patients	—	2.5 mg on dialysis days*

* Enalaprilat is dialysable. Dosage on nondialysis days should be adjusted depending on the blood pressure response.

CONGESTIVE HEART FAILURE

Use in conjunction with a diuretic and digitalis. Initiate therapy under close medical supervision, usually in a hospital. Monitor blood pressure and renal function before and during treatment with enalapril, because severe hypotension, and more rarely, consequent renal failure have been reported (see WARNINGS and PRECAUTIONS).

When initiating enalapril consider the recent diuretic therapy and possibility of severe salt/volume depletion. Before beginning enalapril reduce diuretic therapy if possible.

The recommended initial daily dose is 2.5 mg. While managing symptomatic hypotension, increase dose gradually, depending on individual response, to the usual maintenance dose of 10-20 mg daily, given in a single dose or divided in two doses. This dose titration may be performed over a two- to four-week period, or more rapidly if indicated by residual signs and symptoms of heart failure. The maximum daily dose is 40 mg.

VASOTEC® I.V. FOR INTRAVENOUS ADMINISTRATION ONLY

VASOTEC® I.V. vials should be inspected visually and should not be used if particulate matter or discoloration is observed.

VASOTEC® I.V. may be administered intravenously as supplied, or mixed with up to 50 mL of one of the following diluents:

5% Dextrose Injection
0.9% Sodium Chloride Injection
0.9% Sodium Chloride Injection in 5% Dextrose
5% Dextrose in Lactated Ringer's Injection

Diluted solutions should be used within 24 hours.

The dose is 1.25 mg every 6 hours administered intravenously over at least 5 minutes. A clinical response is usually seen within 15 minutes. Peak effects after the first dose may not occur for up to four hours after dosing. The peak effects of the second and subsequent doses may exceed those of the first.

No dosage regimen for VASOTEC® I.V. has been clearly demonstrated to be more effective in treating hypertension than 1.25 mg every 6 hours. However, in controlled clinical studies in hypertension, doses as high as 5 mg every 6 hours were well tolerated for up to 36 hours. There has been inadequate experience with doses greater than 20 mg per day.

In studies of patients with hypertension, VASOTEC® I.V. has not been administered for periods longer than 48 hours. In other studies, patients have received VASOTEC® I.V. for as long as 7 days.

The dose for patients being converted to VASOTEC® I.V. from oral therapy for hypertension with enalapril maleate is 1.25 mg every 6 hours administered intravenously over at least 5 minutes. For conversion from intravenous to oral therapy, the recommended initial dose of VASOTEC® tablets is 5 mg once a day with subsequent dosage adjustments as necessary.

Patients on Diuretic Therapy

For patients on diuretic therapy, the recommended starting dose for hypertension is 0.625 mg administered intravenously over at least 5 minutes. A clinical response is usually seen within 15 minutes. Peak effects after the first dose may not occur for up to 4 hours after dosing, although most of the effect is usually apparent within the first hour. If after 1 hour there is an inadequate clinical response, the 0.625 mg dose may be repeated. Additional doses of 1.25 mg may be administered at 6 hour intervals.

For conversion from intravenous to oral therapy, the recommended initial dose of VASOTEC® tablets for patients who have responded to 0.625 mg of enalaprilat every 6 hours is 2.5 mg once a day with subsequent dosage adjustment as necessary.

Dosage Adjustment in Renal Impairment

The usual dose of 1.25 mg of enalaprilat every 6 hours is recommended for patients with a creatinine clearance >30 mL/min [> 0.50 mL/s] (serum creatinine up to approximately 3 mg/dL [265.2 µmol/L]). For patients with creatinine clearance ≤30 mL/min [≤0.50 mL/s] (serum creatinine ≥3 mg/dL [≥265.2 µmol/L]), the initial dose is 0.625 mg (see WARNINGS).

If after 1 hour, there is an adequate clinical response, the 0.625 mg dose may be repeated. Additional doses of 1.25 mg may be administered at 6 hour intervals.

For dialysis patients, the initial dose should be 0.625 mg every 6 hours. (see PRECAUTIONS - Hemodialysis patients).

For conversion from intravenous to oral therapy, the recommended initial dose of VASOTEC® is 5 mg once a day for patients with creatinine clearance >30 mL/min [>0.50 mL/s] and 2.5 mg once daily for patients with creatinine clearance ≤30 mL/min [≤0.50 mL/s]. Dosage should then be adjusted according to blood pressure response.

AVAILABILITY OF DOSAGE FORMS

Barrel-shaped, biconvex tablets, engraved with code number on one side and VASOTEC on other.

VASOTEC® 2.5 mg - yellow, scored, engraved 14.

VASOTEC® 5 mg - white, scored, engraved 712.

VASOTEC® 10 mg - rust-red, engraved 713.

VASOTEC® 20 mg - peach, engraved 714.

All strengths available in bottles of 100 tablets.

VASOTEC® I.V. 1.25 mg per mL, is a clear, colourless solution and is supplied in vials containing 2 mL.

PRODUCT MONOGRAPH AVAILABLE ON REQUEST

(490iv-a,11,92)

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5527, 5959, 5974, 6657

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Is a Long Delay Necessary Before Appendectomy After Appendiceal Mass Formation? A Preliminary Report

S.K.S. Marya, MD, FICS; Pradeep Garg, MS, DNB; Multan Singh, MS, DNB; Ashok K. Gupta, MS; Yogender Singh, MB, BS

The standard treatment for an appendiceal mass is conservative therapy followed by appendectomy after 6 to 10 weeks. With the advent of antibiotics designed to prevent the growth of anaerobes, early appendectomy can now be carried out without complication. The authors studied 56 patients with appendiceal mass formation, 26 (group A) treated conventionally and 30 (group B) treated by early appendectomy. In group B, the infection rate was 17%, the mean operating time was 38.7 minutes, the mean hospital stay was 15 days and there was an early return to work. The corresponding parameters for group A were an infection rate of 8%, a mean operating time of 35.2 minutes, a hospital stay of 19.1 days and a late return to work. Furthermore, 15% of the patients in group A had a recurrent acute episode during the waiting period. Overall, early appendectomy appears to be a safe and cost-effective treatment for appendiceal mass formation.

Le traitement classique d'une masse appendiculaire est tout d'abord conservateur, puis suivi d'une appendicectomie, de 6 à 10 semaines plus tard. Avec la venue des antibiotiques destinés à prévenir la croissance des anaérobies, une appendicectomie précoce peut maintenant être pratiquée sans complication. Les auteurs ont étudié 56 patients porteurs d'une masse appendiculaire. Vingt-six (le groupe A) furent traités de façon conventionnelle et 30 (le groupe B) subirent une appendicectomie précoce. Le taux d'infection dans le groupe B fut de 17 %, la durée d'intervention de 38,7 minutes, l'hospitalisation moyenne de 15 jours et les patients réintégrèrent leur travail rapidement. Les paramètres correspondants pour le groupe A furent de 8 % pour le taux d'infection, de 35,2 minutes pour la durée d'intervention, de 19,1 jours d'hospitalisation et le retour au travail fut retardé. De plus 15 % des patients du groupe A subirent une rechute aiguë pendant qu'ils attendaient l'opération. Dans l'ensemble, l'appendicectomie précoce paraît être un traitement sûr et rentable des masses appendiculaires.

Unlike acute cholecystitis, there is no good alternative to appendectomy for the treatment of acute appendicitis. Reluctance to accept early operation prompted Murphy to observe "the responsibility lies with the first doctor called in to see these patients."[1] The conventional management of an appendiceal mass (a phlegmon of adherent omentum or small-bowel loops or an abscess) deviates from the principle of early operation. It involves localizing the infection and inflammation by conservative therapy followed by appendectomy after an interval of 6 to 10 weeks. In the present study, we implemented

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Accepted for publication Apr. 29, 1992

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Murphy's principles as soon as the appendiceal mass was conducive to operative manipulation.

Patients and Methods

Of 61 patients who had an appendiceal mass and were seen by the authors between 1989 and 1991, 29 were managed conservatively (group A) and 32 were managed by early appendectomy (group B). There was no follow-up for three patients in group A, and conservative therapy was abandoned for drainage of an appendiceal abscess in two patients from group B. These patients were excluded, leaving 26 patients in group A and 30 patients in group B for study.

After the clinical diagnosis was established, conservative treatment was continued for group A patients (Oschner–Sherren regimen) who were discharged after resolution of the mass. Patients were given a tentative date fointerval appendectomy (a minimum of 6 weeks after discharge).

Group B patients had appendectomy as soon as the lump became impalpable. They were discharged after removal of the stitches on the 7th or 8th postoperative day. Patients in both groups received combinations of gentamicin, ampicillin and metronidazole for as long as tenderness, tachycardia and high temperature persisted. After stabilization, ampicillin only was given to group A patients until 5 days after discharge and to group B patients until the 5th postoperative day. Metronidazole (500 mg) was given to group B patients on the day of the operation.

The two groups of patients were compared with respect to the operating time, the complications of appendectomy, the rate of wound infection, the duration of hospitalization and the time of return to work.

Results

The results of our study are shown in Table I. During the waiting period between diagnosis of the appendiceal mass and appendectomy, four group A patients had acute exacerbation of their condition and were operated on immediately.

The operating time was similar in both groups, and there were no complications of operation, such as fistula formation or spread of infection, ineither group. Group B patients had a higher infection rate, but the duration of hospitalization was longer in group A patients.

In the interval from conservative treatment to appendectomy in group A patients, 42% did not go to work. The remaining 58% preferred light work, but all patients in this group shared a common fear that resumption of normal work habits might precipitate an episode of acute appendicitis. After appendectomy for acute appendicitis, group B patients returned to work earlier than group A patients (3 to 4 weeks versus 8 to 10 weeks).

Table I. Parameters Associated With the Treatment of an Appendiceal Mass

Parameter	Group A ($n = 26$)	Group B ($n = 30$)
Wound infection, no. (%)	2 (8)	5 (17)
Mean operating time, min.	35.2	38.7
Mean hospital stay, d	19.1*	15
Recurrence during resting period, no. (%)	4 (15)	—
Return to work	Late	Early

*Mean stay for both conservative treatment and elective appendectomy

Discussion

The management of appendiceal mass formation is controversial. Most medical centres practise initial conservative therapy, followed in 6 to 10 weeksby appendectomy. Few centres advocate immediate appendectomy and drainage.[2]

Proponents of conservative treatment fear that more aggressive therapy may spread an already localized peritonitis or may injure adherent intestine, causing fecal fistula formation. Patients treated conservatively require a seconhospitalization for appendectomy to prevent the 10% to 20% risk of recurrent appendicitis.[2] The second hospitalization itself exposes the patient to a 19% complication rate.[3] Furthermore, during the "resting period" of 6 to 10 weeks, a recurrent acute episode can occur, ranging in frequency from 7% to 46% in different series.[4] In our study there was an acute episode in 15% of patients.

In contrast, an aggressive approach such as appendectomy with drainage carries a complication rate of 36%, which is almost comparable to that for perforated appedicitis presenting without palpable mass.[2] Our approach to early appendectomy adopts a middle course: the mass is rendered subacute to "cold," and free of edema and possible adhesions, so that operation invites few or no local complications. The only complication seen with this approach in our series was a parietal wound infection in five patients

Early operation with an almost negligible complication rate has been made possible by modern antibiotics. Nonavailability of a broad

spectrum of effective antibiotics, especially those designed to combat anaerobes, was likelya major factor preventing surgeons from carrying out early operation. The conservative approach does not keep pace with modern therapeutics. Furthermore, exploration of the appendix when the mass becomes impalpable seems no more hazardous than removal of an inflamed turgid appendix in acute episodes.

Early operation is highly cost-effective with respect to operating time, total hospital stay and the patient's return to work. It provides early confirmation of the diagnosis (the only way to confirm appendicitis is by operation) and ensures complete resolution of the patient's condition by circumventing any chance of missed follow-up during the resting period of 6 to 10 weeks.

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BOOK REVIEWS

continued from page 265

Numerous problems in the current technology must be overcome. A mouse source for the MAb results in the production of human antibodies against mouse antigen (HAMA) in about 50% of patients. This may prevent a second use of murine antibodies in those patients. More specificity is required to improve targeting and reduce unwanted background activity in the liver, bone marrow and blood pool. This may be achieved by more specific MAb production, MAb fragmentation, enhancement with drugs such as Interferon and improved labelling efficiency. At present, the technology is expensive for the relatively small improvement in diagnostic yield, although for some patients radioimmunoscintigraphy may affect staging and surgical management.

Manufacturers need to recover the costs of research and development, but the production and clinical trials of MAb are expensive and so is the production of indium 111 and iodine 123, the radiotracers used to label the MAb. Furthermore, the high price may limit clinical use, causing a vicious circle that may further inhibit innovation and arrest progress in what ultimately will likely be a valuable clinical tool.

However, for the clinician, widespread use of this "magic bullet" is still a long way off. Like a cannon firing at a distance, we can see the flash and smoke but have not yet heard the significant bang of its impact on our routine practice.

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SURGERY: SCIENTIFIC PRINCIPLES AND PRACTICE. Edited by Lazar J. Greenfield. 2208 pp. Illust. J.B. Lippincott Co., Philadelphia. 1992. $92 (US). ISBN 0-397-51121-3

This large textbook attempts to address the entire spectrum of the current practice of surgery. This has necessitated contributions from 155 individuals from diverse areas of surgical specialization.

The first quarter of the book is devoted to the scientific principles underlying surgical practice. These cover not only the usual topics of cell structure, metabolism and hemostasis but also more current basic science chapters on anesthesia, tumour biology and transplantation immunology.

The remainder of the book is divided into 21 sections primarily according to anatomic region. This leads to a significant imbalance in terms of prevalence of disease or surgical intervention; for example, the number of pages devoted to diseases of the pancreas is approximately five times the number devoted to the entire specialty of orthopedic surgery and five times the number devoted to the specialty of urology.

The book would more correctly be titled *General Surgery: Scientific Principles of Practice* because that would reflect the editor's intent.

Some surgical specialties are well covered especially surgical endocrinology, the cardiovascular system and pediatric general surgery.

This volume would be of value in hospital libraries in which students and residents demand a comprehensive reference text for the specialty of general surgery. It would also be of value to the practising general surgeon and to general surgery residents. It will be of limited value to residents and practitioners in other specialties because it contains inadequate material for their specialty interest and too much detail regarding general surgery for casual reference. The first quarter of the book, however, is excellent and covers the basic principles underlying all surgical specialties.

A final note regarding the size of the

continued on page 280

The Value of Reoperation for Recurrent Glioblastoma

Peter Dirks, MD;* Mark Bernstein, MD, FRCSC;* Paul J. Muller, MD, FRCSC;†
William S. Tucker, MD, FRCSC†

To determine the value of reoperation alone (no further surgical procedures or radiotherapy), 43 patients (27 men, 16 women) with recurrent supratentorial glioblastomas who underwent a second craniotomy for recurrent tumour were reviewed retrospectively. The patients ranged in age from 27 to 66 years (median 53 years).

All patients were treated initially by surgical resection and external radiation (50 Gy in 25 fractions through parallel opposed regional fields). In addition, 10 patients (23%) received chemotherapy, 3 patients (7%) received photodynamic therapy and 9 patients (21%) received interstitial brachytherapy postoperatively. Although none of the patients had further surgical procedures or radiotherapy after reoperation for tumour recurrence, 5 of the 43 did receive single-agent chemotherapy.

The median survival after the first operation was 57 weeks. The median interval between first and second operations was 32 weeks. Median survival after reoperation was 19 weeks. An interval of more than 50 weeks between the two operations correlated with a significant ($p < 0.05$) increase in survival. The death rate for reoperation was 4.6%. The infection rate was 9.3%. The authors conclude that reoperation alone confers a modest but valuable increase in survival, especially if the interval between operations is greater than 50 weeks.

Afin de mesurer l'apport d'une seconde opération seule (sans autre intervention chirurgicale ou radiothérapie), 43 patients (27 hommes, 16 femmes) porteurs d'un glioblastome supratentoriel récidivant qui subirent une deuxième craniotomie lors de la récidive tumorale ont été étudiés en rétrospective. L'âge des patients variait de 27 à 66 ans (médiane, 53 ans).

Tous les patients avaient été traités initialement par résection chirurgicale et radiation externe (50 Gy, en 25 doses fractionnées par champs régionaux opposés, parallèles). De plus, 10 patients (23 %) avaient reçu de la chimiothérapie. Trois patients (7 %) avaient eu un traitement photodynamique et neuf patients (21 %) avaient reçu une brachythérapie interstitielle postopératoire. Même si aucun de ces patients n'a subi d'autre intervention chirurgicale ou n'a reçu de radiothérapie après la réopération pour rechute, 5 des 43 ont eu une monochimiothérapie.

La survie médiane après la première opération a été de 57 semaines. L'intervalle médian entre la première et la seconde opération a été de 32 semaines. La survie médiane après la deuxième intervention a été de 19 semaines. Un intervalle excédant 50 semaines entre les deux opérations a été relié à une augmentation significative ($p < 0,05$)) de la survie. La mortalité consécutive à la seconde opération a été de 4,6 %

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Accepted for publication June 11, 1992

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et le taux d'infection, de 9,3 %. Les auteurs concluent qu'une réopération seule procure un allongement modeste mais mesurable de la survie, spécialement quand l'intervalle entre les opérations dépasse 50 semaines.

The rationale for the surgical treatment of malignant gliomas includes the following: to make a histologic diagnosis; to alleviate the neurologic deficit caused by local tumour compression; to reduce elevated intracranial pressure from the tumour mass; and to achieve cytoreduction of the tumour to increase the efficacy of adjuvant therapy.[1] The rationale for the surgical treatment of recurrent malignant gliomas is almost the same. The goals of reoperation are to prolong survival and to maintain or improve the patient's functional status.

Historically, the rate of repeat craniotomy for recurrence of malignant primary brain tumours has been low (0% to 10%).[2] In the past 10 years, a number of studies on the effect of reoperation have been carried out.[2-8] However, the value of reoperation alone, without adjuvant therapy, for recurrent malignant astrocytoma is unclear.

The purpose of this report was to examine the effect of reoperation alone in a relatively homogeneous group of patients, who had no additional antineoplastic therapy after the reoperation.

Patients and Methods

Patients who underwent reoperation for malignant astrocytic tumours (glioblastoma multiforme and malignant astrocytoma without necrosis) between 1978 and 1990 were reviewed. Patients were taken from the services of three neurosurgeons whose operative approach was similar. All patients had their initial and repeat operations at hospitals fully affiliated with the University of Toronto.

Inclusion criteria were: histologically confirmed supratentorial glioblastoma multiforme or malignant astrocytoma at both first and subsequent operations; full course of external radiotherapy completed after the initial operation; gross total or subtotal resection of tumour at repeat operation; reoperation for recurrence performed at least 1 month after the completion of postoperative radiation; and Karnofsky performance status of 50 or greater at reoperation.

Exclusion criteria were: low-grade astrocytoma at first operation; reoperation other than for resection of recurrent tumour (e.g., cyst drainage, limited biopsy, cerebrospinal fluid shunting, wound repair, hematoma evacuation or insertion of devices for intratumoral therapy); more than one reoperation for recurrence; experimental therapy or additional radiotherapy after the second operation (e.g., photodynamic therapy, brachytherapy, intratumoral interferon therapy); and failure to confirm recurrence histologically.

Reoperation was performed for increasing neurologic deficit or elevated intracranial pressure with evidence on the computed tomography (CT) scan of recurrence in an accessible location, or occasionally for recurrence (on CT) without further symptomatic progression.

Findings

Patient Characteristics

Thirty-eight patients (88%) had glioblastoma multiforme and 5 patients (12%) had malignant astrocytoma at initial operation. There were 27 men (63%) and 16 women (37%). The patients ranged in age from 27 to 66 years at initial operation (median 53 years). Twenty-seven patients (63%) had right-sided tumours, 15 patients (35%) had left-sided tumours, and 1 patient (2%) had a bifrontal tumour.

All patients received a full course of external radiotherapy (50 Gy in 25 fractions through parallel opposed regional fields) after initial operation. In addition, 10 patients (23%) received chemotherapy, 9 patients (21%) received interstitial brachytherapy and 3 patients (7%) received photodynamic therapy. After reoperation, none of the patients received additional radiotherapy or experimental therapy and five patients (12%) had single-agent chemotherapy.

Morbidity and Mortality After Reoperation

Two patients died within 4 weeks of reoperation, giving a surgical death rate of 4.6%. Four patients (9.3%) suffered infectious complications; three of them had brain abscesses (one died and is included in the 4.6% death rate) and one patient had an infected scalp flap. Two patients, one of whom died within 4 weeks of the operation, had systemic glioblastoma metastases at autopsy.

Survival after Reoperation

The median interval between operations was 32 weeks. The median survival after reoperation calculated by the Kaplan–Meier method was 19 weeks and the mean total survival was 57 weeks (Fig. 1). Patients with an interoperative interval greater than 50 weeks had significant prolongation of survival after reoperation (Table I).

Discussion

The role of reoperation for malignant gliomas has been studied in several articles.[2-8] Young and colleagues[8] reviewed the role of a single reoperation in 24 patients from two university centres over an 8-year period and reported a median survival of 14 weeks. Karnofsky performance status greater than 60 correlated with a significant increase in median survival (22 weeks versus 9 weeks), and length of interoperative interval correlated weakly with prolonged median survival.

Salcman and colleagues[5] studied prospectively a consecutive series of 74 patients entered into a multimodality therapy program for malignant astrocytoma. Forty patients underwent reoperation for recurrence. All patients had previously received chemotherapy and radiotherapy, and chemotherapy was continued after reoperation. The median survival after reoperation was 37 weeks. Patients younger than 40 years who underwent reoperation had a significantly increased total survival (121 weeks versus 60 weeks from the time of the first operation). Patients with malignant astrocytoma had a prolonged but insignificant increase in survival (82 weeks versus 65 weeks). Age, sex, Karnofsky performance status and interoperative interval did not correlate with survival time after reoperation.

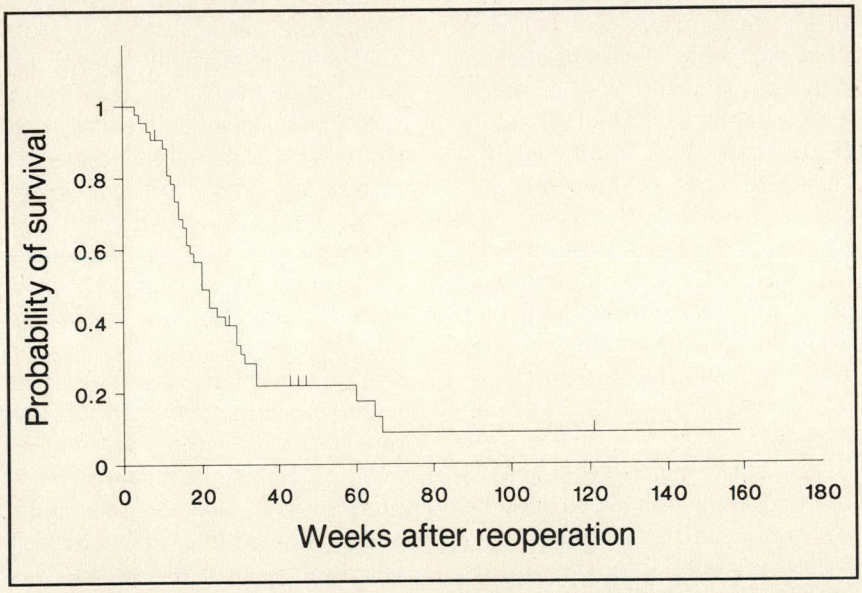

FIG. 1. Kaplan–Meier representation of probability of survival after reoperation for recurrent glioblastoma. Tick marks represent patients who were still alive at time of analysis.

Table I. Characteristics and Survival of Patients With Recurrent Glioblastomas

Characteristic	Patients, no. (%)	Median survival, wk	*p* value
Sex			
Male	27 (63)	20	NS
Female	16 (37)	21	
Tumour location			
Right	27 (63)	21	NS
Left	15 (35)	20	
Bifrontal	1 (2)	—	
Tumour type			
Malignant astrocytoma	5 (21)	8	NS
Glioblastoma multiforme	38 (88)	21	
Interoperative interval, wk			
≤ 50	31 (72)	17	0.047*
> 50	12 (28)	46	
Age, yr			
≤ 50	21 (49)	21	NS
> 50	22 (51)	18	

*Significant difference as independent variable by Mann–Whitney test

Harsh and associates[4] reviewed retrospectively a consecutive series of 70 patients who underwent reoperation for malignant astrocytoma over a 9-year period. An unspecified proportion of these patients had the initial operation at another institution. The median survival after reoperation was 36 weeks for glioblastoma multiforme and 88 weeks for anaplastic astrocytoma. Younger age correlated with high-quality survival after reoperation in both tumour groups and in total survival in those with glioblastoma multiforme. The interoperative interval correlated with total survival in both tumour groups, and higher Karnofsky performance status at reoperation correlated with high-quality survival in glioblastoma multiforme. Poor outcome was associated with a Karnofsky score less than 70.

The extraordinary survival after reoperation in the group with anaplastic astrocytoma may be attributed in part to the fact that 48% of the patients with anaplastic astrocytoma at reoperation had a low-grade astrocytoma at the time of the first operation. Twenty-six percent of patients with glioblastoma multiforme had anaplastic astrocytoma at initial operation, and 3% had low-grade astrocytoma. The

natural history of low-grade astrocytomas is associated with a more favourable course than that of malignant astrocytoma.[9] Patients with known malignant degeneration from low-grade to high-grade astrocytoma survived longer than those whose initial tumour diagnosis was that of high-grade astocytoma.[10]

Ammirati and associates[3] reviewed the role of reoperation over 11 years in 55 consecutive patients with glioblastoma multiforme and anaplastic astrocytoma. Eighty percent of the patients had the initial operation at other centres, and 20% had more than one reoperation. The median survival after reoperation was 29 weeks for glioblastoma multiforme and 61 weeks for anaplastic astrocytoma. Factors correlating with improved median survival after reoperation were preoperative Karnofsky score (more than 70 versus less than 70 — survival times of 48.5 and 19 weeks respectively), extent of surgical resection (gross resection versus subtotal resection — survival times of 51 weeks and 23 weeks respectively), pathologic grade, and interoperative interval (more than 6 months versus less than 6 months — survival times of 62 weeks and 33 weeks respectively). However, varying types of adjuvant therapy were given at the first operation and at reoperation, and survival data did not take into account the role of adjuvant therapy on survival. Furthermore, 13% of these patients did not receive radiotherapy after the initial operation.

Wallner and colleagues[7] examined whether the CT scan of recurrent malignant astrocytomas at the time of reoperation could predict survival. Thirty-nine patients who underwent reoperation for recurrent anaplastic astrocytoma or glioblastoma multiforme were examined. Eighty-two percent of the patients had their initial operations at other centres. In 26% the tumour at the initial operation was of lower grade than that at reoperation. All but one patient had external radiotherapy before reoperation. No patient had external or interstitial radiation after reoperation. Sixty-two percent of patients had chemotherapy initially; however, it is unclear whether this was continued after reoperation. The median interoperative interval was 10 months and median survival after reoperation was 30 weeks. In patients with glioblastoma multiforme (79% of patients), there were trends toward increased survival with a Karnofsky score greater than 90, frontal tumours, smaller tumours and tumours with less preoperative peritumoral edema. The authors concluded that the perioperative CT scan appearance of malignant astrocytomas could not be used in predicting survival after reoperation and therefore in choosing patients likely to benefit from reoperation.

Our study comprised patients who underwent a single reoperation for recurrent malignant astrocytoma. Only 12% of patients received adjuvant therapy (chemotherapy) after their reoperation. All patients had their initial and repeat operations at the same centre, usually done by the same surgeon. All patients had an initial diagnosis of glioblastoma (88%) or malignant astrocytoma (12%). The median survival in our series of recurrent gliomas after second surgery was 19.5 weeks; this survival time is similar to that of the 14 to 16 weeks found in the surgery-only control group of the second Brain Tumor Study Group protocol.[11] From a survey of 11 papers on the results of therapy for glioblastoma, Mineura[12] found that in 1462 patients treated with surgery alone the average median survival time was 19.9 weeks.

In our study, patients with a longer interoperative interval had significantly prolonged survival, a finding similar to that of previous studies.[4,8]

Functional status has been shown to be an important factor in survival in several other studies.[3,4,8] In the two most recent studies,[2,4] a Karnofsky performance score of less than 70 was associated with a poorer outcome.

Previous studies stated that reoperation for recurrent malignant astrocytoma was a reasonably safe therapeutic manoeuvre with low morbidity and mortality. The operative death rate (within the first 4 weeks after operation) ranged from 0% to 5.1% in the recent studies on reoperation.[2-4,6-8] These rates are similar to our operative death rate of 4.6% (one death from disseminated intravascular coagulation in a patient found to have metastatic glioblastoma at autopsy and one death from brain abscess). In a recent prospective analysis of 104 consecutive patients who underwent craniotomy for excision of supratentorial glioma, the death rate in the first 30 days was 3.3%.[13] The death rate for reoperation was stated to be the same as for initial operation. Reoperation seems to be a relatively safe therapeutic option.

The rate of infectious complications in our series was 9.3%. There were three deep infections (abscesses) and one superficial infection. Only one patient received antibiotics prophylactically at the time of reoperation. Our wound infection rate for reoperation is similar to that reported in the literature — 0% to 21%.[3,5-8] Tenney and colleagues,[14] in a review on wound infections in clean neurosurgical cases, reported rates of infectious complications in patients with gliomas of 4% for initial operation and 13% for reoperation.

Reoperation for recurrent malignant astrocytoma is reasonably safe. Modestly prolonged survival can be

expected after surgical treatment alone. Patients considered for reoperation for glioblastoma or malignant astrocytoma should also be considered for adjunctive experimental therapy whenever possible.

We thank Drs. L. Resch and J. Bilbao for help with neuropathological review of all the cases, and Denise Best and Dina Evans for preparing the manuscript.

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NOTICES

continued from page 260

reconstruction. The combination of lectures and optional hands-on cadaver laboratory sessions will expose attendants to the latest information and techniques. The course will offer 17 hours of Category I CME credit. For more information contact: Department of Academic Affairs, 403C, Scripps Clinic and Research Foundation, 10666 N Torrey Pines Rd., La Jolla, CA 92037; phone: (619) 554–8556; fax: (619) 554–6310

The Immune Consequences of Trauma, Shock and Sepsis — Mechanisms and Therapeutic Approaches

This third international congress will be held from Mar. 2 to 5, 1994, in Munich, Germany. Some tentative topics include: injury and systemic inflammatory response syndrome; molecular mechanisms of signal transduction; analysis of stress gene expression in traumatic shock; growth factors in inflammation; interventional strategies in the therapy of septic shock; major burn injury — autogeneic and allogeneic tissue culture as adjuncts to therapy; hepatocellular injury in ischemia, trauma and sepsis; and cytokines in acute phase states and trauma. The due date for abstracts is Oct. 30, 1993. For more information contact: Dr. Eugen Faist, Ludwig-Maximilians-Universität Munich, Klinikum Grosshadern, Department of Surgery, Marchioninistrasse 15, 8000 Munich 70, Germany; phone: 49–89–7095–3441; fax: 49–89–7095–2460.

International Surgical Week

The 35th World Congress of Surgery of the International Society of Surgery with its integrated societies presents International Surgical Week from Aug. 22 to 27, 1993, in Hong Kong. For more information contact: Congress Secretariat, ISW Hong Kong, Department of Surgery, University of Hong Kong, Queen Mary Hospital, Hong Kong; phone: (852) 819–2235; fax: (852) 855–1897.

Correction

The title of the article by Paterson and colleagues in the April 1993 issue of the journal, pages 162 to 164 was incorrect. The title should read "Late anastomotic ulceration after ileocolic resection in childhood."

PRESCRIBING INFORMATION

CIPRO® CIPROFLOXACIN HYDROCHLORIDE THERAPEUTIC CLASSIFICATION ANTIBACTERIAL AGENT

CIPRO® I.V. CIPROFLOXACIN INJECTION THERAPEUTIC CLASSIFICATION ANTIBACTERIAL AGENT

ACTIONS

Ciprofloxacin, a synthetic fluoroquinolone, has a bactericidal mode of action. This action is achieved through inhibition of DNA gyrase, an essential component of the bacterial DNA replication system. Inhibition of the alpha subunit of the DNA gyrase blocks the resealing of the nicks on the DNA strands induced by this alpha subunit, leading to the degradation of the DNA by exonucleases. This bactericidal activity persists not only during the multiplication phase, but also during the resting phase of the bacterium.

Ciprofloxacin retained some of its bactericidal activity after inhibition of RNA and protein synthesis by rifampin and chloramphenicol, respectively. These observations suggest ciprofloxacin may possess two bactericidal mechanisms, one mechanism resulting from the inhibition of DNA gyrase and a second mechanism which may be independent of RNA and protein synthesis.

INDICATIONS AND CLINICAL USES

A) Oral Administration

CIPRO® (Ciprofloxacin hydrochloride tablets) may be indicated for the treatment of patients with the following infections caused by susceptible strains of the indicated microorganisms:

Respiratory Tract Infections: Acute bronchitis and acute pneumonia caused by: *E. cloacae, E. coli, H. influenzae, K. pneumoniae, P. mirabilis, P. aeruginosa, S. aureus, S. pneumoniae*

Due to the nature of the underlying conditions which usually predispose patients to *Pseudomonas* infections of the respiratory tract, bacterial eradications may not be achieved in patients who display clinical improvement despite evidence of *in vitro* sensitivity. In patients requiring subsequent courses of therapy, CIPRO® should be used alternately with other antipseudomonal agents. Some strains of *Pseudomonas aeruginosa* may develop resistance during treatment. Therefore, susceptibility testing should be performed periodically during therapy to detect the emergence of bacterial resistance.

Urinary Tract Infections: Upper and lower urinary tract infections, such as complicated and uncomplicated cystitis, pyelonephritis, and pyelitis, caused by: *C. diversus, C. freundii, E. cloacae, E. coli, K. pneumoniae, K. oxytoca, M. morganii, P. mirabilis, P. aeruginosa, S. marcescens, S. aureus, S. epidermidis, S. faecalis*

Skin and Soft Tissue Infections: caused by: *E. cloacae, E. coli, K. pneumoniae, P. vulgaris, P. mirabilis, S. pyogenes, P. aeruginosa, S. aureus, S. epidermidis*

Bone and Joint Infections: caused by: *S. marcescens, P. aeruginosa, S. aureus, E. cloacae*

Infectious Diarrhea: (When antibacterial therapy is indicated) caused by: *E. coli (enterotoxigenic strains), C. jejuni, S. flexneri, S. sonnei*

B) Intravenous Administration

CIPRO® I.V. (Ciprofloxacin injection) may be indicated for the treatment of patients with the following infections caused by susceptible strains of the indicated microorganisms:

Respiratory Tract Infections: acute pneumonia caused by: *E. coli, K. pneumoniae, E. cloacae, P. mirabilis, P. aeruginosa, H. influenzae, H. parainfluenzae, S. pneumoniae*

Due to the nature of the underlying conditions which usually predispose patients to *Pseudomonas* infections of the respiratory tract, bacterial eradications may not be achieved in patients who display clinical improvement despite evidence of *in vitro* sensitivity. In patients requiring subsequent courses of therapy, CIPRO® should be used alternately with other antipseudomonal agents. Some strains of *Pseudomonas aeruginosa* may develop resistance during treatment. Therefore, susceptibility testing should be performed periodically during therapy to detect the emergence of bacterial resistance.

Urinary Tract Infections: Upper and lower complicated urinary tract infections including pyelonephritis caused by: *C. diversus, E. coli, K. pneumoniae, P. mirabilis, P. aeruginosa*

Skin or Skin Structure Infections: caused by: *E. cloacae, E. coli, K. pneumoniae, M. morganii, P. vulgaris, P. mirabilis, P. aeruginosa, S. aureus, S. pyogenes*

Septicemia: caused by: *E. coli, S. typhi*

Bone: caused by: *E. cloacae, P. aeruginosa*

Appropriate culture and susceptibility tests should be performed prior to initiating treatment in order to isolate and identify organisms causing the infection and to determine their susceptibilities to ciprofloxacin. Therapy with CIPRO® and CIPRO® I.V. may be initiated before results of these tests are known. However, modification of this treatment may be required once results become available or if there is no clinical improvement. Culture and susceptibility testing performed periodically during therapy will provide information on the possible emergence of bacterial resistance. If anerobic organisms are suspected to be contibuting to the infection, appropriate therapy should be administered.

CONTRAINDICATIONS

CIPRO® (ciprofloxacin hydrochloride tablets) and CIPRO® I.V. (ciprofloxacin injection) are contraindicated in patients who have shown hypersensitivity to ciprofloxacin or other quinolone antibacterial agents.

WARNINGS

Children The safety of CIPRO® and CIPRO® I.V. (ciprofloxacin hydrochloride tablets and ciprofloxacin injection) in children has not yet been established. Damage to juvenile weight-bearing joints and lameness were observed both in rat and dog studies but not in weaned piglets (see TOXICOLOGY in Product Monograph). Histopathological examination of the weight-bearing joints in immature dogs revealed permanent lesions of the cartilage. Consequently, CIPRO® and CIPRO® I.V. should not be used in prepubertal patients. Experience in pubertal patients below 18 years of age is limited.

Pregnancy The safety of CIPRO® and CIPRO® I.V. in the treatment of infections in pregnant women has not yet been established (see PRECAUTIONS).

PRECAUTIONS

General Anaphylactic reactions including cardiovascular collapse have occurred rarely in patients receiving therapy with CIPRO® and CIPRO® I.V. (ciprofloxacin hydrochloride tablets and ciprofloxacin injection). These reactions may occur within the first 30 minutes following the first dose and may require epinephrine and other emergency measures.

CIPRO® and CIPRO® I.V. may cause central nervous system (CNS) stimulation which may lead to tremor, restlessness, light-headedness, confusion, and very rarely to hallucinations or convulsive seizures. Therefore, CIPRO® and CIPRO® I.V. should be used with caution in patients with CNS disorders, such as severe cerebral arteriosclerosis or epilepsy. Patients with known convulsive seizure disorders should only be treated with CIPRO® and CIPRO® I.V. if anticonvulsant therapy has been initiated.

SERIOUS AND FATAL REACTIONS HAVE BEEN REPORTED IN PATIENTS RECEIVING CONCURRENT ADMINISTRATION OF CIPRO® I.V. AND THEOPHYLLINE. These reactions include cardiac arrest, seizure, status epilepticus and respiratory failure. Similar serious adverse events have been noted with administration of theophylline alone, however, the possibility that ciprofloxacin may potentiate these reactions cannot be eliminated. **If concomitant use cannot be avoided, the plasma levels of theophylline should be monitored and appropriate dosage adjustments should be made.**

Severe hypersensitivity reactions characterized by rash, fever, eosinophilia, jaundice, and hepatic necrosis with fatal outcome have also been reported to occur very rarely in patients receiving ciprofloxacin in combination with other drugs. The possibility that these reactions were related to ciprofloxacin cannot be excluded. Ciprofloxacin should be withdrawn at the first appearance of a skin rash or other signs of hypersensitivity.

Crystalluria related to ciprofloxacin has been reported only rarely in man because human urine is usually acidic. Crystals have been observed in the urine of laboratory animals, usually from alkaline urine. Patients receiving ciprofloxacin should be well hydrated and alkalinity of the urine should be avoided. The recommended daily dose should not be exceeded.

Pseudomembranous colitis has been reported with virtually all antibacterial agents, including ciprofloxacin, and may range in severity from mild to life-threatening. Therefore, it is important to consider this diagnosis in patients with diarrhoea subsequent to the administration of antibacterial agents.

Subsequent to diagnosis of pseudomembranous colitis, therapeutic measures should be initiated. Mild cases will usually respond to discontinuation of drug alone. In moderate to severe cases, consideration should be given to the management with fluids, electrolytes, protein supplementation and treatment with an antibacterial drug effective against *C. difficile*.

Prolonged use of CIPRO® and CIPRO® I.V. may result in the overgrowth of nonsusceptible organisms. Careful observation of the patient is therefore essential, and if superinfection should occur during therapy, appropriate measures should be taken.

Pregnancy The safety of CIPRO® and CIPRO® I.V. in pregnancy has not yet been established. CIPRO® and CIPRO® I.V. should not be used in pregnant women unless the likely benefits outweigh the possible risk to the fetus. CIPRO® and CIPRO® I.V. has been shown to be non-embryotoxic and non-teratogenic in animal studies.

Nursing Mothers Ciprofloxacin is excreted in human milk. A decision should be made to discontinue nursing or to discontinue the administration of CIPRO® and CIPRO® I.V., taking into account the importance of the drug to the mother and the possible risk to the infant.

Drug Interactions Concurrent administration of ciprofloxacin with theophylline may lead to an elevated plasma concentration and prolongation of elimination half-life of theophylline. This may result in increased risk of theophylline-related adverse reactions. If concomitant use cannot be avoided, plasma concentrations of theophylline should be monitored and dosage adjustments made as appropriate.

Ciprofloxacin has been shown to interfere with the metabolism and pharmacokinetics of caffeine. Excessive caffeine intake should be avoided.

Some quinolones, including ciprofloxacin, have been associated with transient increases in serum creatinine levels in patients who are concomitantly receiving cyclosporine.

Quinolones have been reported to increase the effects of the oral anticoagulant warfarin and its derivatives. During concomitant administration of these drugs, the prothrombin time or other appropriate coagulation tests should be closely monitored.

Probenecid blocks renal tubular secretion of ciprofloxacin and has been shown to produce an increase in the level of ciprofloxacin in the serum.

Concomitant administration of a nonsteroidal anti-inflammatory drug (fenbufen) with a quinolone (enoxacin) has been reported to increase the risk of CNS stimulation and convulsive seizures.

Antacids containing aluminum or magnesium hydroxide have been shown to reduce the absorption of ciprofloxacin. Concurrent administration with these agents should be avoided.

Administration of sucralfate prior to CIPRO® resulted in a 30% reduction in absorption of ciprofloxacin. Concurrent administration with ciprofloxacin should be avoided.

Oral ferrous sulfate at therapeutic doses decreases the bioavailability of oral ciprofloxacin, therefore concomitant therapy is not advised.

The use of calcium supplement reduces the absorption of ciprofloxacin. Concurrent administration should be avoided. In particular cases, concurrent administration of ciprofloxacin and glyburide can intensify the action of glyburide (hypoglycemia).

Renal Impairment Since ciprofloxacin is eliminated primarily by the kidney, CIPRO® and CIPRO® I.V. should be used with caution and at a reduced dosage in patients with impaired renal function. (See DOSAGE AND ADMINISTRATION).

Hepatic Impairment In preliminary studies in patients with stable chronic liver cirrhosis, no significant changes in ciprofloxacin pharmacokinetics were observed. The kinetics of ciprofloxacin in patients with acute hepatic insufficiency, however, have not been fully elucidated. An increased incidence of nausea, vomiting, headache and diarrhea were observed in this patient population.

ADVERSE REACTIONS

CIPRO® (ciprofloxacin hydrochloride tablets) and CIPRO® I.V. (ciprofloxacin injection) are generally well tolerated. During worldwide clinical investigation, 16,580 courses of ciprofloxacin treatment were evaluated for drug safety.

Adverse events, possibly, probably or highly probably related to ciprofloxacin occurred in 1395 (8.8%) of patients. The adverse reactions according to treatment (oral, iv, and sequential therapy) show that the incidence of adverse reactions was 8.0% for the group treated orally, 17% for the group treated with CIPRO® I.V. and 15.3% for the group treated sequentially. The difference between the oral and iv group relates to adverse vascular reactions which are known to be associated with iv administration.

In orally treated patients enroled in clinical trials, the most frequently reported events, possibly,probably drug-related were: nausea (1.3%) and diarrhea (1.0%).

In patients treated with CIPRO® I.V., the most frequently reported events, possibly, probably drug-related were: rash (1.8%), diarrhea (1.0%), and injection site pain (1.0%).

Events possibly, probably drug-related occurring at a frequency of less than 1% with ciprofloxacin oral and i.v. treatment during clinical trials and subsequent post-marketing surveillance are as follows:

Gastro-Intestinal: vomiting, dyspepsia, abdominal pain, flatulence, dysphagia, enlarged abdomen, dry mouth, stomatitis, gastrointestinal moniliasis, anorexia, jaundice. The following have been reported very rarely: constipation, tooth discoloration, ulcerative stomatitis, pseudomembranous colitis, intestinal perforation, esophagitis, increased appetite, gastro-intestinal hemorrhage, melena, liver damage, tenesmus, ileus, toxic megacolon, hepatomegaly, glossitis.

Cardiovascular system: palpitation, tachycardia, phlebitis. The following have been reported very rarely: hypertension, hot flashes, cerebrovascular disorder, syncope, kidney vasculitis, vasodilation, atrial fibrillation, cardiac arrest, angina pectoris, electrocardiogram abnormality, myocardial infarct, substernal chest pain, pulmonary embolus, pericarditis, hypotension.

Nervous System: increased sweating, dizziness, agitation, tremor, somnolence, insomnia, confusion, hallucinations, convulsion, headache. The following have been reported very rarely: anxiety, depression, nervousness, apathy, depersonalization, abnormal dreams, hemiplegia, sleep disorder, neuritis, paresthesia, polyneuritis, diplopia, meningism, migraine, increase of intracranial pressure. In some instances these reactions occurred after the first administration of CIPRO®. In these instances, CIPRO® has to be discontinued and the doctor should be informed immediately.

Respiratory System: dyspnea. The following have been reported very rarely: hiccup, increased cough, stridor, larynx edema, voice alteration, lung edema, pharyngitis, hyperventilation, lung hemorrhage.

Skin and Appendages: rash, pruritus. The following have been reported very rarely: urticaria, photosensitive dermatitis, angioedema, alopecia.

Special Senses: tinnitus, abnormal vision, taste perversion. The following have been reported very rarely: conjunctivitis, corneal opacity, eye pain, colour blindness, chromatopsia, diplopia, ear pain.

Urogenital System: albuminuria, hematuria. The following have been reported rarely: leukorrhea, dysuria, urinary retention, acute kidney failure, abnormal kidney function, nephritis, vaginitis.

Hypersensitivity: rash. The following have been reported rarely: pruritus, drug fever, anaphylactic/ anaphylactoid reactions including facial, vascular and laryngeal edema, serum sickness, petechiae, haemorrhagic bullae and small nodules (papules) with crust formation showing vascular involvement (vasculitis), Stevens-Johnson-syndrome, interstitial nephritis, hepatitis; very rarely, major liver disorders including hepatic necrosis, joint pain, Lyell Syndrome.

Blood and Blood constituents: eosinophilia, leukocytopenia, leukocytosis, anaemia, granulocytopenia. Very rarely: haemolytic anaemia, thrombocytopenia, thrombocytosis, altered prothrombin levels.

Laboratory values: increased alkaline phosphatase, Gamma - GT, transaminases, cholestatic parameters, lactic dehydrogenase, BUN, NPN, AST, ALT, decreased creatinine clearance, hypercholesteremia, albuminuria, bilirubinemia, hyperuricemia, increased sedimentation rate. The following have been reported rarely: electrolyte abnormality, hypercalcemia, hypocalcemia, acidosis, crystalluria and haematuria.

Other: thrombophlebitis. Very rarely, asthenia, death.

Most of the adverse events reported were described as only mild or moderate in severity.There have been 54 reports of arthropathies with CIPRO®. Ten of these reports involved children. Arthralgia was usually the first symptom which led to rapid assessment and withdrawal of the drug. No irreversible arthropathies have been observed.

SYMPTOMS AND TREATMENT OF OVERDOSE

Overdose has not yet been reported with CIPRO® and CIPRO® I.V. (ciprofloxacin hydrochloride tablets and ciprofloxacin injection). In the event of acute overdosage, the stomach should be emptied by inducing vomiting or by gastric lavage. The patient should be carefully observed and given supportive treatment.

DOSAGE AND ADMINISTRATION

The determination of dosage for any particular patient must take into consideration the severity and nature of the infection, the susceptibility of the causative organism, the integrity of the patient's host-defense mechanisms, and the status of renal function.

Oral Administration

CIPRO® (Ciprofloxacin hydrochloride tablets) may be taken before or after meals. Absorption is faster on an empty stomach. Patients should be advised to drink fluids liberally and not take antacids containing magnesium or aluminum.

Adult The recommended dosages of oral CIPRO® are:

Location of Infection	Type/Severity	Unit Dose	Frequency	Daily Dose
Urinary Tract	Mild/Moderate	250 mg	q 12h	500 mg
	Severe/Complicated	500 mg	q 12h	1000 mg
Lower Respiratory Tract				
Bone & Joint	Mild/Moderate	500 mg	q 12h	1000 mg
Skin & Soft Tissue	Severe/Complicated*	750 mg	q 12h	1500 mg
Infectious Diarrhea	Mild/Moderate/Severe	500 mg	q 12h	1000 mg

* e.g. hospital-acquired pneumonia, osteomyelitis

Depending on the severity of the infections, as well as the clinical and bacteriological responses, the average treatment period should be approximately 7 to 14 days. Generally, treatment should last 3 days beyond the disappearance of clinical symptoms or until cultures are sterile. Patients with osteomyelitis may require treatment for a minimum of 6 to 8 weeks and up to 3 months. With acute cystitis, a five-day treatment may be sufficient.

Intravenous Administration

Adult The recommended adult dosages of CIPRO® I.V. (ciprofloxacin injection) are:

Location of Infection	Type/Severity	Unit Dose	Frequency	Daily Dose
Urinary Tract	Moderate/Severe/ Complicated	200 mg to 400 mg	q 12h	400 mg to 800 mg
Lower Respiratory Tract Skin or Skin Structure Blood Bone	Moderate	400 mg	q 12h	800 mg

Definitive clinical studies have not been completed in severe respiratory tract and other infections.

The duration of treatment depends upon the severity of infection. Generally ciprofloxacin should be continued for at least 3 days after the signs and symptoms of infection have disappeared. The usual duration is 7 to 14 days. However, for severe and complicated infections more prolonged therapy may be required. Bone and joint infections may require treatment for 4 to 6 weeks or longer.

Sequential IV/PO Therapy

In patients receiving intravenous ciprofloxacin, oral ciprofloxacin may be substituted when clinically indicated at the discretion of the physician. Clinical studies evaluating the use of sequential IV/PO therapy in septicemia have not yet been completed.

Impaired Renal Function

Ciprofloxacin is eliminated primarily by renal excretion. However, the drug is also metabolized and partially cleared through the biliary system of the liver and through the intestine. This alternate pathway of drug elimination appears to compensate for the reduced renal excretion of patients with renal impairment. Nonetheless, some modification of dosage is recommended, particularly for patients with severe renal dysfunction. The following table provides a guideline for dosage adjustment. However, monitoring of serum drug levels provides the most reliable basis for dosage adjustments. Only a small amount of ciprofloxacin (<10%) is removed from the body after haemodialysis or peritoneal dialysis.

Creatinine Clearance mL/s (mL/min)	Dose
≥ 0.5 (30)	No Dose adjustment
< 0.5 (30) and patients on haemodialysis or peritoneal dialysis	Use recommended dose once daily or half usual dose twice daily

When only the serum creatinine concentration is available, the following formula (based on sex, weight and age of the patient) may be used to convert this value into creatinine clearance. The serum creatinine should represent a steady state of renal function:

	Creatinine Clearance mL/sec		In traditional units mL/min
Males:	Weight (kg) x (140 - age) / 49 x serum creatinine (μmol/L)	**Males:**	Weight (kg) x (140 - age) / 72 x serum creatinine mg/100 mL
Females:	0.85 x the above value	**Females:**	0.85 x the above value

Children

The safety and efficacy of CIPRO® and CIPRO® I.V. in children have not been established.

CIPRO® and CIPRO® I.V. should not be used in prepubertal patients (see WARNINGS).

AVAILABILITY OF DOSAGE FORMS

Tablets:

Cipro® 250 Each tablet is engraved MILES on one side and 512 on the other and contains ciprofloxacin hydrochloride equivalent to 250 mg ciprofloxacin. Bottles of 100.

Cipro® 500 Each tablet is engraved MILES on one side and 513 on the other and contains ciprofloxacin hydrochloride equivalent to 500 mg ciprofloxacin. Bottles of 100 and unit dose packages of 100.

Cipro® 750 Each tablet is engraved MILES on one side and 514 on the other and contains ciprofloxacin hydrochloride equivalent to 750 mg ciprofloxacin. Bottles of 50 and unit dose packages of 100.

Injection:

Cipro® I.V. Each mL contains 10 mg of ciprofloxacin, in vials of 20 mL and 40 mL.

Product Monograph available upon request.

References: **1.** Cipro / Cipro I.V. Canadian Product Monograph, MILES CANADA INC., September 1991.
2. Current manufacturers' prices as of Jan.,1993.

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Coat of Arms of the Canadian Association of General Surgeons

Robert H. Thorlakson, MD, FRCS, FRCSC, FACS

The background to the granting of a coat of arms for the Canadian Association of General Surgeons is described. To help the reader understand the process, the author details how he applied the basic rules and philosophies of the art of heraldry to his design. He hopes this description will stimulate other societies and associations to create their own coats of arms.

Le contexte de l'octroi du blason de l'Association canadienne des chirurgiens généraux est décrit. Pour aider le lecteur à comprendre le processus, l'auteur décrit en détail comment il a appliqué les règles fondamentales et les philosophies de l'héraldique à son motif. Il espère que cette description incitera d'autres sociétés et associations à créer leurs propres blasons.

The Royal College of Physicians and Surgeons of Canada (RCPSC) was founded in 1929 by an act of the Canadian parliament. Initially, the College offered two specialty qualifications: fellowship in general medicine and fellowship in general surgery. In 1937, at the request of the Canadian Medical Association, the College offered qualifications in seven other specialties. Over the years additional specialties have been added. This was particularly so after the war when the fractionation of medicine and surgery increased rapidly. By 1991, the RCPSC officially recognized 52 specialty and subspecialty qualifications. It became apparent to general surgeons that the College could not be an advocate of any one specialty group. Therefore the delineation of a specialty society for general surgeons was considered.

The first meetings of a committee to form what became the Canadian Association of General Surgeons (CAGS) took place in 1976 at the University of Toronto. The inaugural meeting of this new association was held in May 1977 in Toronto.

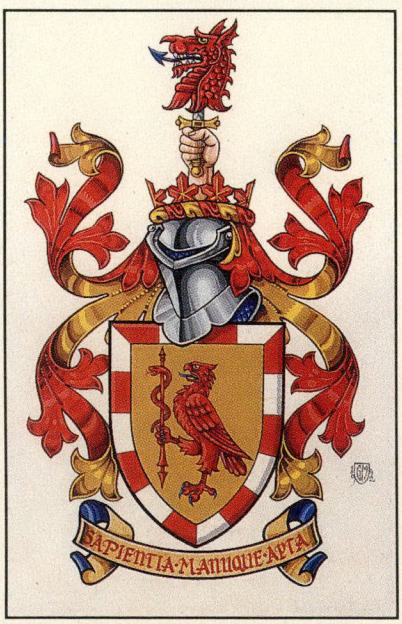

FIG. 1. Canadian Association of General Surgeons' coat of arms.

Background

The RCPSC had received its official grant of arms from the College of Arms, London, England, in 1962. The CAGS had wanted a coat of arms since its inception. There had been one or two unsuccessful attempts to bring this about. Renewed interest was stimulated by the creation of a Canadian heraldic authority to patriate this beautiful form of art and honour and to make it accessible to all Canadians. In 1988, Queen Elizabeth II transferred the exercise of our Canadian heraldic prerogative to the Governor General, making possible the creation of the Canadian Heraldic Authority. In the short time since

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Accepted for publication Apr. 6, 1993

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the Authority was established, hundreds of government bodies, corporations, institutions and individuals have petitioned for coats of arms, and dozens of new symbols have already been granted. Indeed, at the time of the application for the CAGS coat of arms, there were more than 300 grants of arms waiting to be finalized. Canada's 125th anniversary in 1992 added considerable impetus to the number of applications.

Basic Rules and Philosophies

The art of heraldry is ancient. Initially, in the 12th century, it had a practical application as a form of individual identification. The art and science of heraldry developed over the next several hundred years, becoming highly decorative and sophisticated.

Some generalizations can be made about the creation of a coat of arms. It should be simple, bold, colourful and well balanced. The most basic rule is that simple heraldry is good heraldry. Although this is an ancient and medieval art form, some modern idioms can be brought to bear. Each coat of arms is as special as an individual's signature and must be different from those of all others. Because of its pictorial nature it must be symbolic. The challenge is to pick a combination of symbols and colours that best reflect the entity it represents.

A coat of arms or "achievement of arms" is made up of several components. The basic components of a coat of arms are the shield, the helmet, the mantling and, from the top of the helmet, the crest. A man in full armour was unrecognizable so that a distinctive coat was worn that could be recognized over his armour. This was called his "coat of arms." These arms were displayed on his banners, shields and horse cloth, as well as his coat. Because few people could read in medieval times, the coat of arms was depicted on a shield. A personal crest of light wood or boiled leather came to be worn like a coxcomb on top of the helmet. Below the crest a simple silken mantle hung down to keep the heat of the sun off the back of the armour. In coats of arms, this now has been swirled and slashed to make a decoration on either side of the shield. With the addition of a motto on a scroll this forms the normal heraldic "achievement." Occasionally, there may be "supporters" on either side of the shield. Only five colours or tinctures are in general use in heraldry although this is starting to change. There are also two metals — gold and silver — which may also be depicted as yellow and white. A number of furs may also be used.

On the shield there is usually a charge or heraldic device placed upon a background or field. Colour is not placed on another colour or metal on metal because this is too indistinct at a distance. Colour shows up well on metal or metal on colour. The colours on the shield are usually repeated on the mantling, although this may not be so if there is a good reason. The mantling has a colour on one side and is lined by a metal on the other.

Although charges and symbols may be borrowed from other sources and coats of arms for various reasons, each must vary, so that the coat of arms is distinctive to an individual or to a group.

The CAGS Coat of Arms

The Shield

The shield has a red and white border which alludes to our barber-surgeon's origin. The main charge on a golden field is an eagle taken from the crest of the mother college of surgery, the Royal College of Surgeons of England. It is differenced in that the imperial crown has been removed, the head has been turned 180° to look forward and its colour has been changed from gold to red to represent surgery. A lance is held in its right claw to represent any surgical instrument and in combination with a serpent is a modified caduceus of the medical profession. The colour red and the metal gold are taken from the RCPSC in recognition of our own Canadian college.

The Crest

On the top of the helmet is a circlet or coronet of red maple leaves, which alludes to Canada. From it, the right hand of a surgeon grasps a dagger impaling a dragon's head erased, symbolizing the dragon of disease defeated.

The Mantling

The mantling is in surgical red lined in gold.

The Motto

The motto below on a golden ribbon with red lettering is taken from our own Royal College's motto "With a Keen Mind and Skilful Hand." The last half has been used and combined with the word wisdom, which embodies knowledge and judgement. Thus, the motto of the CAGS is *Sapientia Manuque Apta* ("Wisdom and a Skilful Hand"). Only one language can be used, so Latin has been substituted as it has by our RCPSC.

Comments

The thrust of the coat of arms of the CAGS has been to recognize its

heritage, the barber-surgeons, the Royal College of Surgeons of England, the RCPSC and its country of origin, Canada. Its aim is to defeat the dragon of disease by wisdom and a skilful hand.

The evolution of this coat of arms has taken many forms and variations. Its final form was guided by the noted heraldic artist, Gordon Macpherson of Burlington, Ont., who has rendered the library painting (Fig. 1) that is also depicted on the cover of this issue.

The coat of arms for the CAGS has been accepted officially by the Chief Herald of Canada, Robert D. Watt. The formal Letters Patent Granting Arms are issued to the CAGS and the arms are entered in the Public Register of Arms, Flags and Badges of Canada. A notice of grant is published in the *Canadian Gazette*. This document, produced entirely by hand on acid-free artist's paper, is approximately 56 cm (22 in) × 76 cm (30 in). It features in colour the coats of arms of the Governor General of Canada, and the Canadian Heraldic Authority across the top, the newly generated arms in the centre below and the grant text in embellished calligraphy in English on the left and in French on the right.

The coat of arms of the CAGS will be suitably framed with a matt of red velvet to represent surgery with a gold box frame, and it will then be presented to the RCPSC to hang in its new quarters in Ottawa.■

BOOK REVIEWS

continued from page 270

book. At 2000 pages the text is bulky and unwieldy. It would have been much better divided into two or three separate volumes.

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CLINICAL PEDIATRIC UROLOGY. 3rd edition. Panayotis P. Kelalis, Lowell R. King and A. Barry Belman. 1467 pp. Illust. W.B. Saunders Company, Philadelphia. 1992. $235 (US). ISBN 0-7216-3233-5

This textbook is devoted to the clinical practice of pediatric urology. The authors are recognized experts in the material covered in their respective chapters. A "changing of the guard" in pediatric urology can be seen in this book because two-thirds of the authors are new. Accordingly, many of the chapters have been extensively reworked.

The practice of pediatric urology has changed considerably since the second edition of this book appeared in 1985. The widespread use of ultrasonography has revolutionized the practice of pediatric urology, and this change more than any other is reflected in the content and presentation. The textbook opens with a chapter on antenatal diagnostics and is followed by chapters covering ultrasonography, uroradiology and nuclear medicine. The chapter on the presentation of urologic diseases has been moved from chapter one in the second edition to chapter seven in the third edition. The current emphasis on imaging technology is obvious; however, the ability to obtain and interpret a urologic history cannot be overemphasized.

New chapters on the physiology of micturition and on renal physiology are important additions to this textbook because a preponderance of pediatric urology is devoted to facilitating bladder function and to preserving renal function. The chapter on obstructive uropathies has been greatly expanded. There is some duplication of material, and this emphasizes important issues and facilitates the flow of independently authored chapters; however, renal dysplasia and cystic disease are covered in several chapters and two chapters are devoted to cloacal and anorectal malformations.

The discussion of genitourinary anomalies is disjointed and would be better served by a separate chapter on urogenital embryology. There is no chapter on pediatric anesthesia. Without the improvements in pediatric anesthesiology and the concomitant progress in understanding the unique physiology of the pediatric patient, much of the surgery now considered routine would entail far greater risks. Therefore, a discussion of the anesthetic requirements of infants and children seems prudent.

The full spectrum of pediatric urology is otherwise covered in detail from enuresis to renal transplantation. Considering the delays inherent in the publication of any multiauthored textbook, this edition is fairly up to date, with references as recent as 1991. The third edition is well written, practical and easy to read. It is disappointing that some of the chapters are strikingly similar to those written by the same authors in other major textbooks of urology. It meets the demand for a single resource encompassing all pediatric urology and as such is recommended for urology residents, clinicians and academicians. It is also well suited for the interested pediatric surgeon, pediatrician and pediatric nephrologist. The

continued on page 283

SPONSORS' NEWS
NOUVELLES DES PARRAINS

The Canadian Association of General Surgeons

1993 Annual Meeting

The annual meeting of the Canadian Association of General Surgeons (CAGS) will be held in conjunction with the Royal College annual meeting in Vancouver, Sept. 9 to 13, 1993. The Program Committee, chaired by Dr. John MacFarlane, has arranged a full 5 days of courses, lectures, seminars and paper sessions from Thursday to Monday inclusive.

There will be two postgraduate courses. The first course on Thursday, Sept. 9, will feature laparoscopic surgery. It will include sections on gastrointestinal diseases, hernia repair, biliary tract disease and litigation and credentialling. International guests for this course include Professor Alfred Cuschieri from Scotland and Dr. John Hunter from Atlanta.

The second postgraduate course will be held Monday, Sept. 13. It will address malignant diseases of the large intestine. The presentation will involve screening, diagnosis, complex management and new technologies including laparoscopic colonic surgery. International faculty participating in this course are Professor W. Heald from England and Dr. T. Rich from Houston.

On Friday morning the CAGS will present a symposium on quality assurance in general surgical practice, chaired by Dr. Chris Heughan. This 2-hour session will define quality assurance, address clinical practice guidelines and introduce an approach to quality improvement.

Following the symposium, the annual W.R. Ghent Lecture will be delivered by Dr. E. Moore of Denver. He will speak on the effects of immediate postinjury enteral feeding on sepsis.

The first paper session, to be presented Friday afternoon, will include the CAGS resident research and the Lederle awards papers.

The CAGS presidential address will be delivered by Dr. Marvin Wexler at 16:45 and will be followed by the CAGS annual business meeting.

On Saturday, Sept. 11, the second paper session will start the morning and will be followed at 09:30 by the first Langer Lecture presented by Professor Cuschieri, who will speak on "The Cutting Edge of Minimal Access Surgery."

Also, Saturday is the CAGS CME Day, and the Self-Assessment Examination with the touch-pad responder program will be chaired by Dr. Paul Belliveau from 10:15 to 11:30. A 1-hour symposium on management of endocrine disorders of the head and neck will be chaired by Dr. Ted Young, starting at 13:30. The Royal College Medallist in Surgery will speak at 14:30 and will be followed by the popular CAGS symposium on unexpected findings at surgery, chaired by Drs. John Guy of Toronto and Peter Roy of Halifax. The annual colorectal lecture will close Saturday with an invited presentation by Dr. Phil Gordon of Montreal. The CAGS reception will be held on Saturday evening.

The morning of Sunday, Sept. 12, will begin with a combined paper and poster session with the Canadian Association of Gastroenterology. The Royal College Gallie Lecture will be given at 11:30. At 13:30, Dr. Bill Fitzgerald of St. Anthony, Nfld., will chair a symposium on efficient diagnosis and management of common abdominal problems. Professor Heald will present the CAGS Lecture at 14:30. He will speak on the management of rectal cancer. Sunday afternoon will conclude with a 2-hour symposium entitled "Option, Opinions and Operations for Obesity Surgery," chaired by Dr. Iain Cleator of Vancouver.

The Program Committee has arranged an exciting meeting, which will be fully integrated with the programs of other specialty societies participating at the Royal College meeting. Members are reminded to complete the preregistration and housing forms circulated by the Royal College to assure satisfactory reservations.

The Canadian Orthopaedic Association

Upcoming Events

The Graham Apley course on the clinical examination

of the musculoskeletal system will be held in Montreal from Oct. 22 to 24, 1993. For further information please contact: Ms. Francine Bienvenu, 3175 Côte Ste-Catherine, Suite 4837, Montréal, QC H3T 1C6; phone: (514) 345-4915.

The Canadian Orthopaedic Foundation (COF) is organizing the second Canadian Hip Hip Hooray Day. On Sunday, June 13, 1993, in centres across Canada, orthopedic patients walk a kilometre to raise funds for orthopedic research. Patterned on the British model, last year's walk was a great success, thanks to the patients, their families and friends.

The Canadian Society for Vascular Surgery

Annual Business Meeting

The annual business meeting of the Canadian Society for Vascular Surgery (CSVS) will be held on Sept. 11, 1993, at noon. This meeting will be held in conjunction with the annual scientific meeting of the Society. Any members wishing to add items to the agenda for this meeting should contact the Secretary at: Victoria Hospital, 375 South St., London, ON, N6A 4G5; phone: (519) 667-6780.

Dr. David Taylor and the Local Arrangements Committee have prepared an excellent social program, including a cocktail reception at Vancouver's Museum of Anthropology and dinner at one of the finer Vancouver restaurants. This year's meeting should prove to be a great success.

The Joseph C. Luke Award

The Joseph C. Luke Award is presented annually to the best clinical or basic research paper presented at the annual meeting of the CSVS. The Selection Committee comprises the following: the CSVS lecturer (Dr. Jonathan Towne), the Society president (Dr. Adrien Bouchard) and the program chairman (Dr. Paul Walker).

The 1992 award was presented to Dr. Joseph Sladen for his paper entitled "Superficial Femoral Vein: A Useful Alternative Arterial Conduit."

A motion will be brought forward at the business meeting to include the submission of a manuscript as one of the criteria for winning this award.

BOOKS RECEIVED
LIVRES REÇUS

This list is an acknowledgement of books received. It does not preclude review at a later date.

Cette liste énumère les livres reçus. Elle n'en exclut pas la critique à une date ultérieure.

Blood Substitutes & Oxygen Carriers. Edited by T.M.S. Chang. 896 pp. Illust. Marcel Dekker Inc., New York. 1992. $175 (US). ISBN 0-8247-8810-9

Diagnosis of Colorectal and Ovarian Carcinoma. Application of Immunoscintigraphic Technology (Targeted Diagnosis and Therapy Series/6). Edited by Robert T. MacGuire and Douglas Van Nostrand. 260 pp. Illust. Marcel Dekker, Inc., New York. 1992. $99.75 (US). ISBN 0-8247-8648-7

Endovascular Surgery. 2nd edition. Edited by S.S. Ahn and W.S. Moore. 612 pp. Illust. W.B. Saunders Company, Philadelphia. 1992. $182. ISBN 0-7216-4370-1

Gastrointestinal Bleeding. Edited by Choichi Sugawa, Bernard M. Schuman and Charles E. Lucas. 564 pp. Illust. Igaku-Shoin Medical Publishers Inc., New York. 1992. $173. ISBN 0-89640-221-5

High Tech Urology, Technical Innovations and Their Clinical Applications. Joseph A. Smith. 362 pp. Illust. W.B. Saunders Company, Philadelphia. 1992. $107 (US). ISBN 0-7216-3053-7

Lumbar Disc Disease. 2nd edition. Edited by Russel W. Hardy, Jr. 373 pp. Illust. Raven Press Ltd., New York. 1992. $125 (US). ISBN 0-88167-951-8

Mechanics of Human Joints — Physiology, Pathophysiology and Treatment. Edited by Verna Wright and Erica L. Radin. 480 pp. Illust. Marcel Dekker Inc., New York. 1993. $185 (US). ISBN 0-8247-8763-3

Musculoskeletal Tissue Banking. William W. Tomford. 251 pp. Illust. Raven Press Ltd., New York. 1993. $75 (US). ISBN 0-88167-995-X

Surgery: Scientific Principles and Practice. Edited by Lazar J. Greenfield. 2208 pp. Illust. J.B. Lippincott Co., Philadelphia. 1992. $92 (US). ISBN 0-397-51121-3

Techniques in Therapeutic Arthroscopy. Edited by J. Serge Parisien. 385 pp. Illust. Raven Press Ltd., New York. 1993. $125 (US). ISBN 0-7817-0054-X

Total Knee Arthroplasty. Edited by James A. Rand. 480 pp. Illust. Raven Press Ltd., New York. 1992. $130 (US). ISBN 0-88167-930-5

continued from page 280

illustrations are of good quality and the price is reasonable.

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COMPLICATIONS IN HEAD AND NECK SURGERY. Edited by Y.P. Krespi and R.H. Ossoff. 582 pp. Illust. W.B. Saunders Company/Harcourt Brace Jovanovich, Inc., Philadelphia. 1993. Price not stated. ISBN 0-7216-2980-6

This comprehensive book outlines major and minor complications in head and neck oncology, classic otolaryngology, head and neck trauma and reconstructive surgery of the head and neck. It is modelled after John Conley's outstanding publication *Complications of Head and Neck Surgery* (1979). Both books begin by covering the complications of anesthesia, blood vessels, sepsis and fistulas. The middle chapters are devoted to complications of specific anatomic entities such as paranasal sinuses, salivary glands, thyroid, pharynx and larynx. The chapter on thyroid and parathyroid surgery gives an excellent account of the disabilities associated with superior laryngeal nerve injury and recurrent laryngeal nerve injury. The last few chapters focus on the complications of chemotherapy and radiotherapy, trauma and plastic reconstructive surgery. This book has chapters on surgery of the skull base, voice rehabilitation and free tissue transfer. There is a very detailed chapter on maxillofacial trauma.

The book is easy to read, and some chapters are mini-books in themselves. Sections on anesthesia complications, laser surgery and blood-borne diseases are superficial and could have been omitted without detracting from the book.

This excellent overview of complications in head and neck surgery adequately replaces Dr. Conley's 14-year-old edition. General surgeons, otolaryngologists and plastic surgeons who perform head and neck surgery will find this an invaluable overview of head and neck complications. It should serve as a reference book and as pleasurable reading material for these surgeons.

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ATLAS OF GYNECOLOGIC SURGERY. Raymond A. Lee. 368 pp. Illust. W.B. Saunders Company/Harcourt Brace Jovanovich Inc., Philadelphia. 1992. $80 (US). ISBN 0-7216-3358-7

The classical surgical procedures presented in this comprehensive atlas are described as a "distillation of several generations of Mayo surgeons which are presently performed by 6 surgeons in the section of gynecological surgery at the Mayo Clinic." The focus is on the performance of well-planned procedures avoiding wasted motions. Emphasis is placed on the classical surgical tenets of adequate exposure, accurate and precise dissection of tissues, perfect hemostasis, approximation of tissues free of tension and persistent attention to detail.

The illustrations by John Hagan were based on photographs taken during operative procedures. The final presentation in each case is "as the surgeon would see it."

The atlas covers the spectrum of surgical procedures performed by the gynecologist in active practice. In addition to mundane procedures (dilatation and curettage), there are ample references and descriptions of the management of unusual conditions (ruptured enterocele).

I found myself questioning some of the presumptions accompanying the description of the unusual operative procedures. When discussing ruptured enterocele and prolapse of the intestines, the author suggests that "prolapse of the vagina after a hysterectomy is occurring with greater frequency." Given the advent of improved surgical techniques, patient selection and operative materials presently utilized, I found it difficult to agree with this suggestion. Fortunately, many of the procedures described throughout the text are not likely to be encountered by the gynecologist in general practice.

There are major shortcomings to this atlas.

Many of the procedures described have been supplanted by newer and more innovative techniques utilizing state of the art technology. A good example is the treatment of benign diseases of the vulva, which the author describes as "a skinning vulvectomy" or a "wide local excision." Most centres now use a carbon dioxide laser to perform many vulvar procedures. Thus, the skin flaps and muscle approximations, so eloquently described, are unlikely to be used in modern practice.

My second area of disappointment is the failure to include simple operative procedures such as sacrospinous fixation for the management of vault prolapse. This newer technique, which is becoming more common, avoids much of the major dissection required in the extensive repair described by the author. I am at a loss to understand why this simple and effective procedure was not included whereas a difficult and unusual hysterectomy through a narrow vagina was.

I was also surprised by the description of a simple total abdominal hysterectomy, perhaps the most common major procedure performed by a practising gynecologist. I found it most unusual that routine closure of the vaginal vault was recommended at a time when many gynecologists are leaving the vault open. Furthermore, I see no place for a two-layer closure of the vaginal vault — a procedure that can increase the risk of trauma to vital structures. Similarly, most teachers are no longer reperitonealizing the pelvic peritoneum. I was left wondering whether the au-

thor and his associates were true to "distilling the work of several generations of Mayo surgeons" or whether they were stuck in a time warp. The author did not adhere to his philosophy of "avoiding wasted motion that prevents the operation from being accomplished safely in the minimum of time."

I was disappointed to see no evidence of newer approaches in gynecologic surgery involving laser technology for management of uterine septum or laparoscopic surgery for managing adnexal disease. With the emphasis on short hospital stays, reduction of operative time and cost and the patient's rapid return to normal activities, I believe that any up to date atlas of gynecologic surgery must include these new approaches, which are being emphasized in both teaching and updating programs.

Although the book describes classical gynecologic procedures in a clear, concise and easily understood manner, I felt dissatisfied upon completing my perusal of the contents. I tried to count the procedures that I would normally do, as described in the text, and I found myself staring at the fingers of one hand. A dilatation and curettage is more likely performed as an office procedure under paracervical block with suction curettage. Cone biopsies are now done under paracervical block by laser or loop electro-excision procedure and are only occasionally performed in the format described. Major procedures of the vulva are rarely undertaken as described for benign disease, and it is quite unusual to approach the internal genitalia through the surgical acrobatics of radical vaginal hysterectomy. Simple abdominal hysterectomies are done with fewer steps, fewer sutures and less trauma to the adjacent tissues. It is unusual to perform a major procedure for uterine prolapse utilizing the complicated and involved procedures described. More and more reconstructive uterine and vaginal procedures are done with laser.

If one is collecting classical references to use in unusual and difficult cases, this atlas would make excellent shelf material. If, however, one's tastes are more in keeping with state of the art as opposed to Studebaker styling and nostalgia, I feel this text is best utilized as a reference book in the hospital or university library.

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TRACHEAL RECONSTRUCTION IN INFANCY. Edited by Thom E. Lobe. 218 pp. Illust. W.B. Saunders Company, Philadelphia/HBJ-Holt-Saunders Distribution Services, Toronto. 1991. $104. ISBN 0-7216-5779-6

This is a text for the specialist but is also useful for nurses, intensive care workers, neonatologists and anesthetists. The conditions discussed are uncommon, and the treatment of these conditions is not only technically difficult but also ethically challenging. For the first time under one cover, a comprehensive plan of management for children who require tracheal reconstruction is presented.

Initially, a general picture of the anomalies is given. However, the embryology is too brief and may only be of use to those studying for fellowship or board examinations (51 references!). The title of chapter two, "Signs and symptoms of congenital stenosis: diagnosis and considerations," is misleading because malacia and clefts are discussed in addition to stenosis. Unfortunately, neither the increasingly common iatrogenic and serious problem of necrotizing tracheobronchitis nor the tracheal complications of tracheostomy are mentioned. Radiographs are wrongly referenced in the text.

All caregivers of these critically ill babies should familiarize themselves with the section on perioperative management of the infant requiring reconstructive tracheal surgery. Anesthesiologists especially should read the section on the anesthetic management of such infants. Chapter nine, which deals with perioperative sedation, analgesia and muscle relaxation, should have been included in the section on anesthetic management. Later chapters concerned with nursing care, rehabilitation and ethics might have been inserted here. The discussion is too general and not specific to the infant with tracheal anomalies. Fortunately, the rest of the text is replete with good nursing advice.

Four chapters deal with surgical reconstruction. Personally, I have consulted and will continue to consult this book for the useful advice found here. The technical diagrams and the clear prose are first rate. The references are complete. A more complete discussion of balloon dilatation would be welcome in the next edition. A report of six cases treated successfully complements the excellent previous technical instruction. Those treating infants with such complex problems will find sound council and moral support here! A final few pages on experimental tracheal reconstruction precede a useful index.

This book is an essential reference for all caregivers involved in the management of neonates and infants with complex tracheobronchial anomalies. The technical chapters dealing with operative and perioperative care are so useful that I would recommend the surgeon have the book close at hand when dealing with infants who require tracheal reconstruction.

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ATLAS OF LAPAROSCOPIC SURGERY. Edited by Eddie J. Reddick, William B. Saye and John D. Corbitt Jr. 116 pp. Raven Press, New York. 1993. $98 (US). ISBN 0-88167-932-1

This atlas for general surgeons was intended initially to cover only laparoscopic cholecystectomy but was expanded to cover laparoscopic appendectomy, vagotomy and pyloroplasty, left colonic resection and herniorrhaphy. On the basis of teaching experiences, the authors intended to elaborate on common mistakes made in laparoscopic procedures.

The atlas is organized into five sections with a series of colour photographs, taken from videotapes, and explanatory text. The first part, which is the longest and most detailed, is on laparoscopic cholecystectomy and occupies more than half the atlas. It includes a discussion on laparoscopic access, both closed and open. The steps in laparoscopic cholecystectomy are well illustrated and well explained. A number of useful techniques are included, such as needle decompression of the gallbladder, cholangiography, exploration of the common bile duct via the cystic duct, choledochoscopy, T-tube placement, Endoloop closure of gallbladder perforation, suture of large vessels in the gallbladder bed and manoeuvres to remove the gallbladder from the abdomen. Most of the colour pictures are of good quality, and the text is clear.

The chapter on appendectomy is very short but clear enough for the reader to visualize the essential steps. The colour pictures show a normal appendix being removed.

The last three chapters, on the management of peptic ulcer, left colonic resection and hernia repair, were added as an afterthought, and the contents certainly reflect this. The colour pictures are few and often out of focus, and they lack the detailed step-by-step illustrations achieved in the first part on cholecystectomy. This is particularly so in the chapter on colonic resection. Surgeons who have not seen a laparoscopic colonic resection will not learn much from this chapter, and those who have will find the description in this atlas quite inadequate. Although the colour pictures are better in the chapter on peptic ulcer management, they are still inadequate. The final part on hernia repair was cursorily prepared. Although the anatomical placement of the mesh is well illustrated in a colour drawing of the inguinal region, the colour pictures do not show these landmarks well.

Overall this atlas is strong on laparoscopic cholecystectomy but is weak in other areas. This parallels clinical experience since laparoscopic cholecystectomy is a well-established procedure whereas other procedures are still evolving. There is certainly a need for good illustrations of laparoscopic procedures — a picture is worth a thousand words — but this need may be better met by producing high-quality videotapes for dissemination of technical information.

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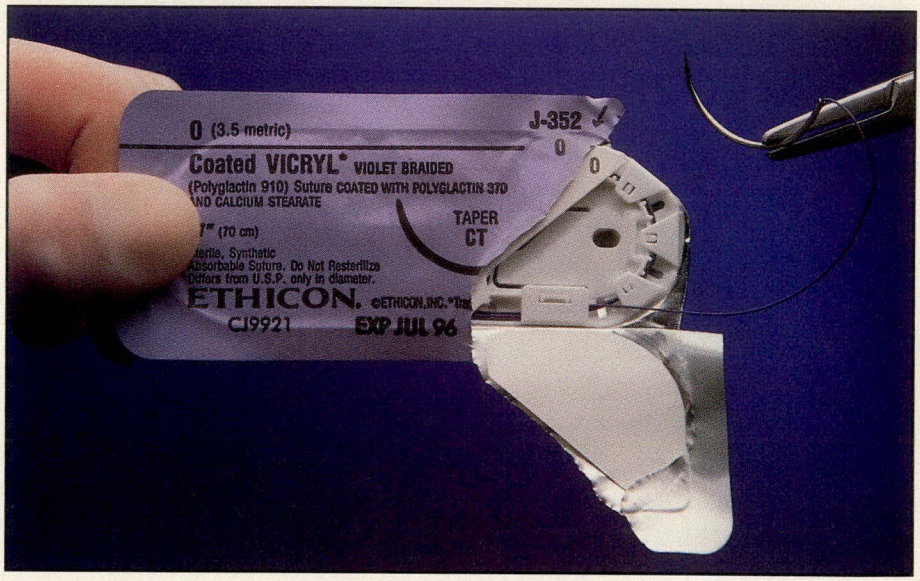

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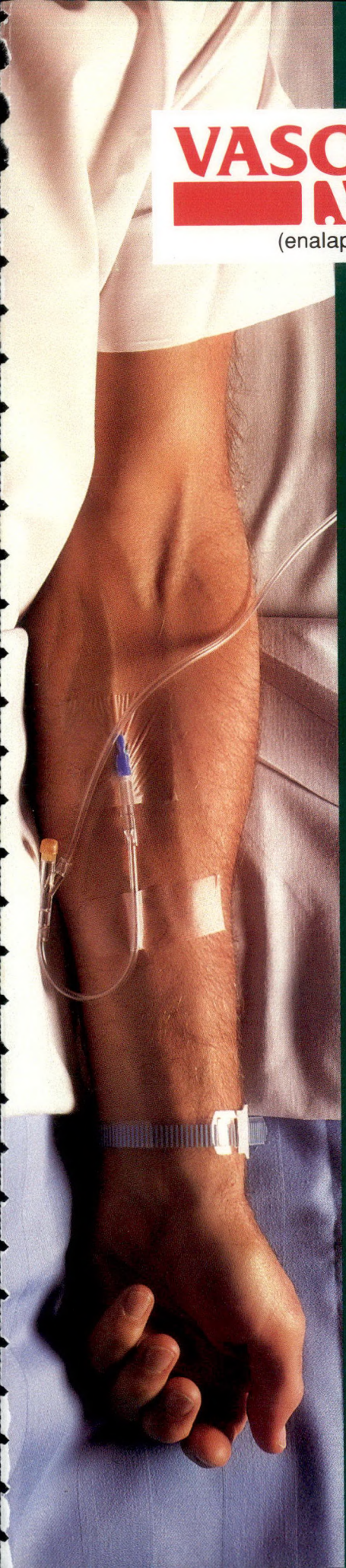

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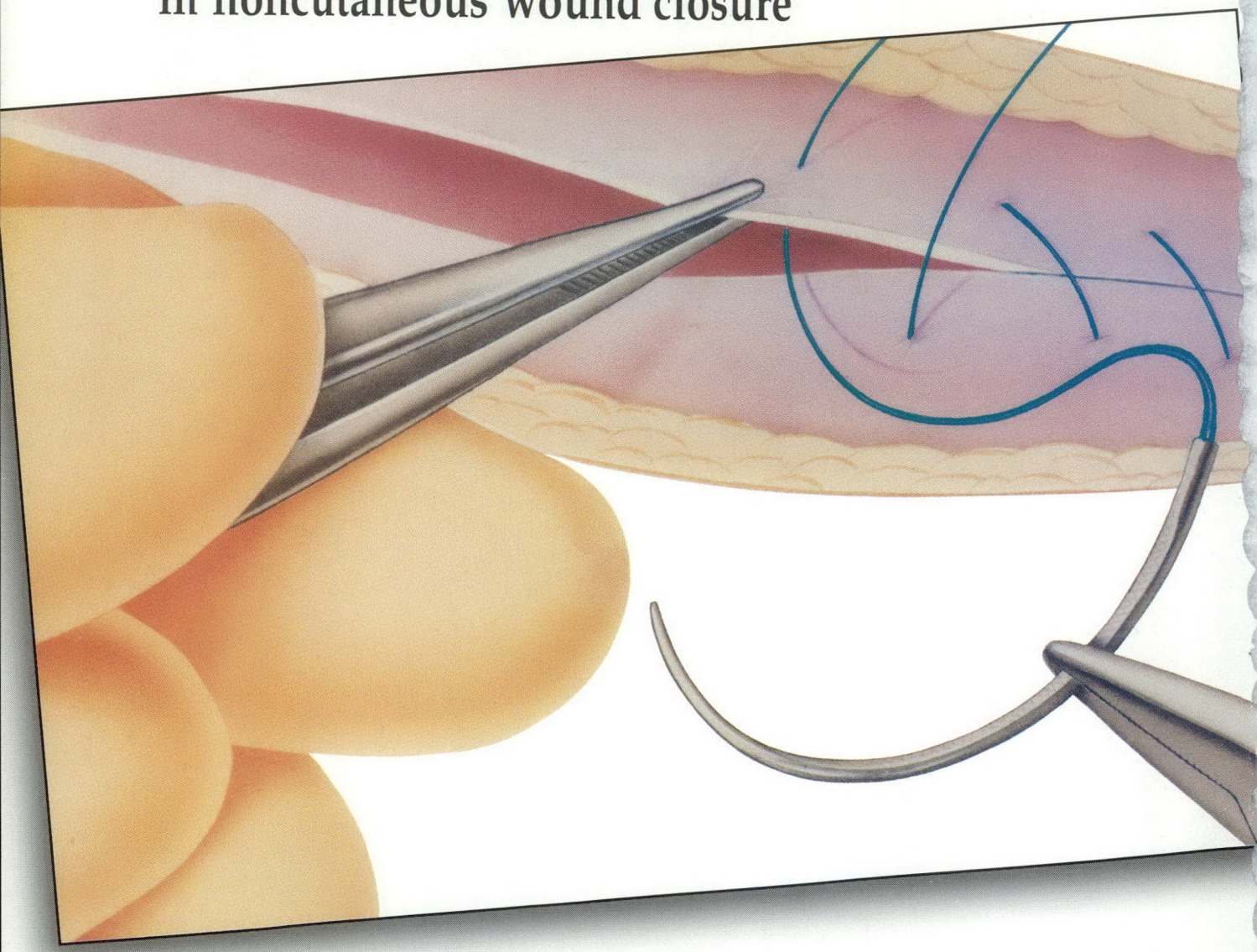

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